JULY 19, 1954

NEWS ISSUE

Electrical World

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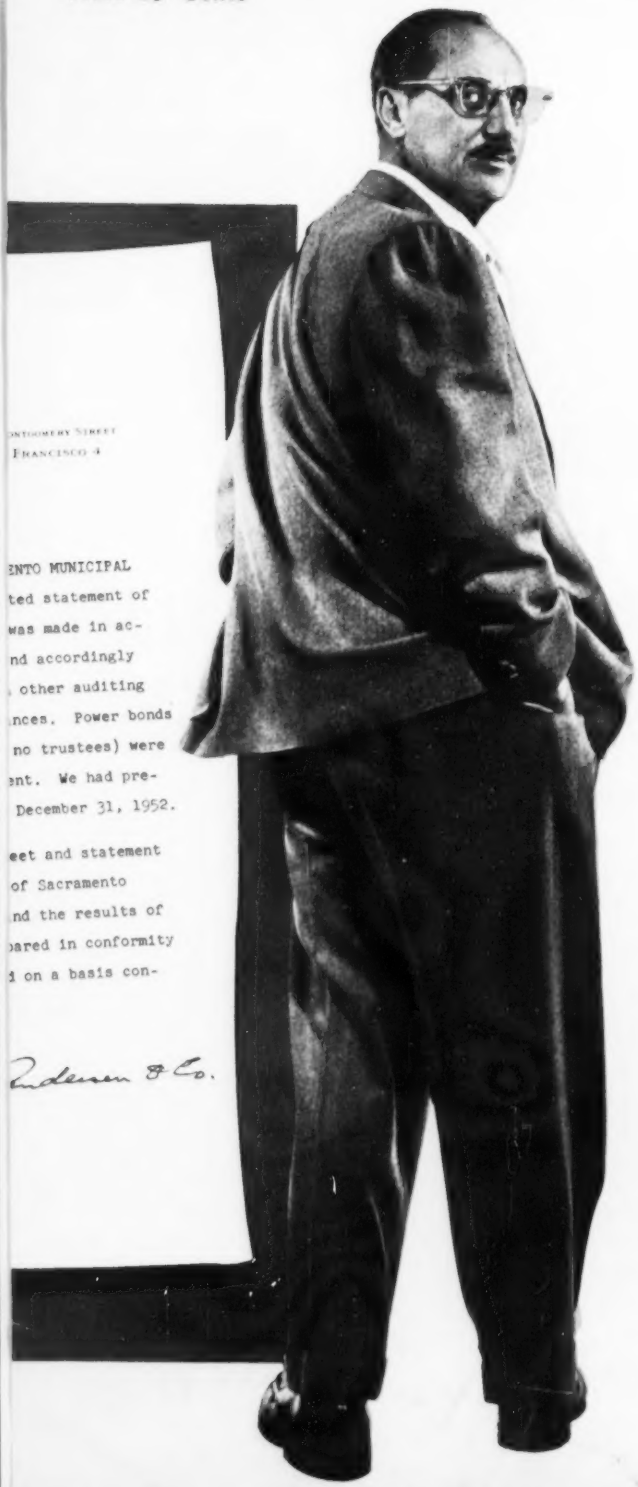

"There's a fascinating story on page 15 about SMUD's annual report. When you read it, Remember — Groucho sent you."

AIEE views today's power system needs... page 25

For provocative items on research and development see Technical Notes... page 10

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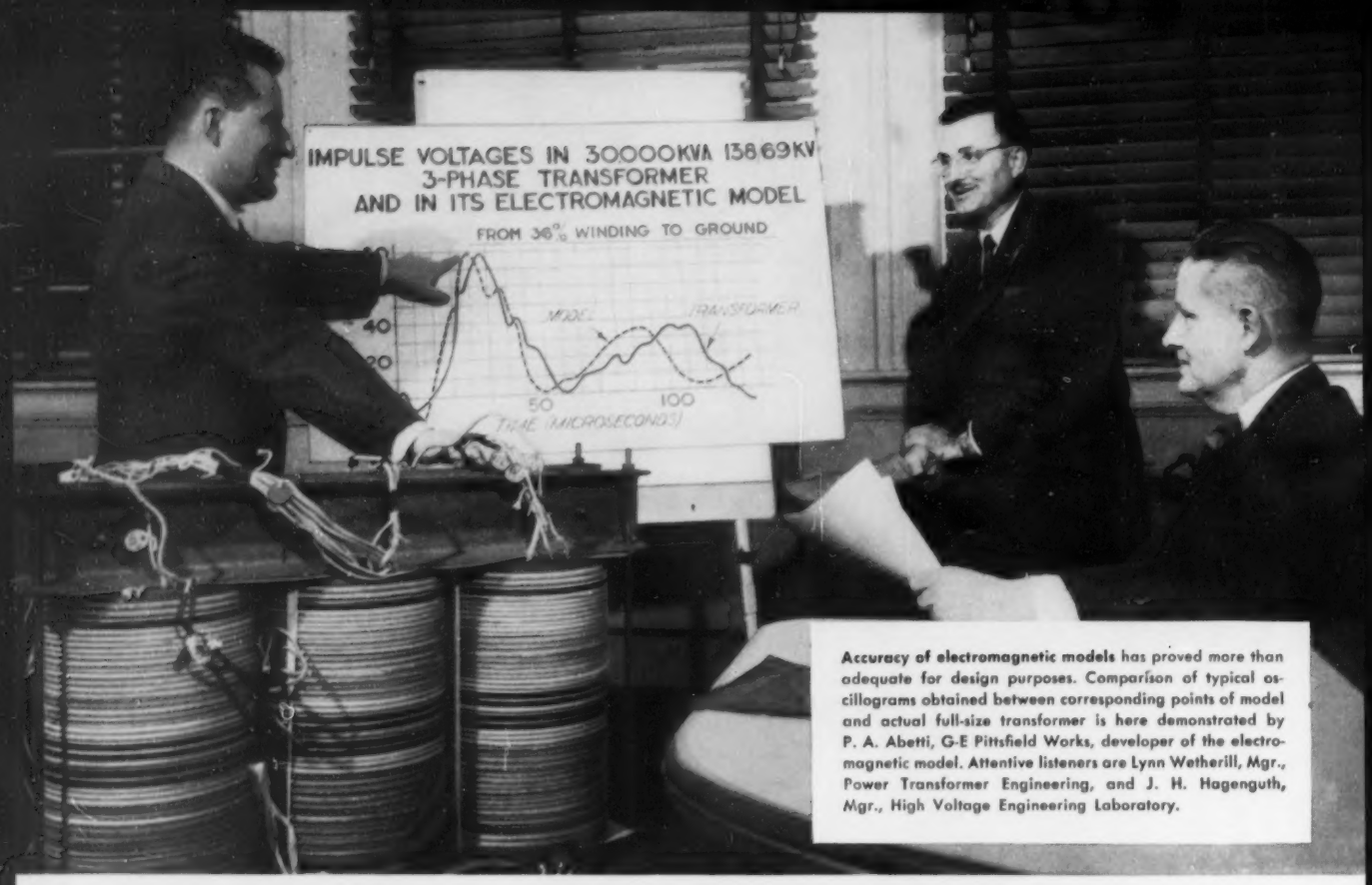
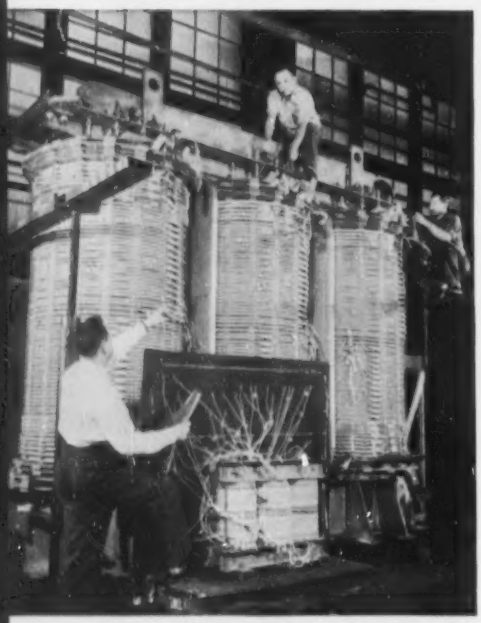


Accuracy of electromagnetic models has proved more than adequate for design purposes. Comparison of typical oscillograms obtained between corresponding points of model and actual full-size transformer is here demonstrated by P. A. Abetti, G-E Pittsfield Works, developer of the electromagnetic model. Attentive listeners are Lynn Wetherill, Mgr., Power Transformer Engineering, and J. H. Hagenguth, Mgr., High Voltage Engineering Laboratory.

New G-E "Model Testing" technique promises SMALLER, MORE RELIABLE POWER TRANSFORMERS



Shown for comparison with 33,333-kva core-and-coils, model is only 1/6 the size, 1/216 the weight and may be built in only 1/10 the time. Here P. A. Abetti checks connections in final assembly.

Major G-E development paves way for improved winding structures, reductions in weight

As the demand grows for power transformers of higher and higher voltage and kva ratings, the problem of predicting transient voltages that may occur in the windings becomes increasingly complex.

Accurate knowledge of these voltages—in the design stage—is a vital factor in determining the most effective use of insulation. It has also a bearing on transformer design, which may be reflected in such advantages as reduced size, weight and cost.

Perfected over a three year period, the new G-E development of testing with electromagnetic models offers the first simple, practical method of obtaining complete and accurate knowledge of transient voltages for any power transformer in advance of actual construction.

A small fraction of the size and weight of equivalent full-size transformers, these models not only provide a rapid, precise method of testing established designs, but also open opportunities for the development of new winding structures, leading to improved reliability.

A new tool has been created for accelerating transformer progress. Its successful application is already being reflected in improved G-E power transformers. The knowledge now being gained promises even greater developments for tomorrow. For more information about electromagnetic model testing, write for bulletin GER-927, General Electric Company, Schenectady 5, New York.

301-226

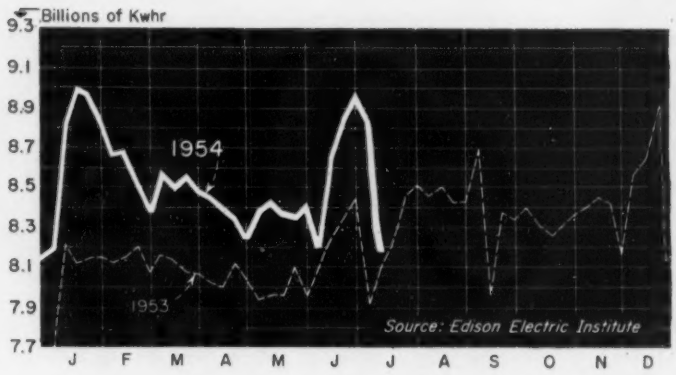
MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Published for 80 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

July 19, 1954 Vol. 142, No. 3



Output Week Ended July 10—8,185,000,000 Kwhr

Seasonally Adjusted Index†—174.2*

Per Cent Changes From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
July 10	+1.1	−5.1	−7.8	−9.8	+7.6	+13.2	+9.1	+4.8	−1.1	−0.9
July 3	+11.5	+10.0	+3.9	+4.9	+18.5	+28.4	+11.5	+9.0	+8.4	+8.2
June 26	+6.3	+1.8	−0.3	−0.3	+12.6	+19.9	+5.9	+7.8	+3.9	+8.6

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load ‡(Million Kw)	May	73.8	73.7	70.7
Capacity (Million Kw)	May	93.81	93.56	84.34
Production (Billion Kwhr)	May	37.43	36.84	36.02
Hydro	May	10.35	9.91	10.29
Fuel	May	27.08	26.93	25.73
Fuel Consumption				
Coal (Million Tons)	May	8.67	8.68	8.59
Oil (Million Barrels)	May	4.25	4.78	6.08
Gas (Billion Cu Ft)	May	94.70	91.10	87.85
Sales (Billion Kwhr)	Apr.	32.31	32.53	31.75
Residential	Apr.	9.93	10.15	8.86
Commercial	Apr.	5.62	5.60	5.15
Industrial	Apr.	14.60	14.67	15.46
Other	Apr.	2.17	2.10	2.28
Net Income Class A & B Companies ($ Million)	Apr.	96.05	94.29	87.29
Estimated Dec. '54 Peak ‡(Million Kw)	Apr.	88.4	88.5	92.1
Kwhr per Residential Customer (12 Month Average)	Apr.	2,415	2,398	2,226
Revenue per Kwhr Residential Service (12 Month Average)	Apr.	2.72¢	2.72¢	2.76¢
Canadian Production (Billion Kwhr)	Apr.	5.65	5.77	5.74

Business Statistics

FRB Industrial Production Index†	May	123*	123	136
Gross National Product Annual Rate ($ Billion)	1st Qtr.	357.8	363.5	363.9
EW 4 Industry Production Index†	Apr.	115.1	116.7	126.5
ENR Construction Cost Index††	June	130.5	129.7	124.4
BLS Consumer's Price Index	May	115.0	114.6	114.0
NEMA Insulation Materials Sales Index†	May	116	124	174
NEMA Electric Appliance Sales Index†	May	88	96	108
NEMA Household Refrig. Sales Index†	May	74	73	81

* Preliminary ** Revised ‡ Class 1 Systems † 1947-49=100 †† 1949=100

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modernizing?

give new equipment the instrumentation it deserves

WHEN you're planning to install new process equipment, plan to take advantage of the full potential of modern methods of measurement and control. It's the sure way to get top value for your modernization investment . . . for the improvements in production economy, quality and versatility possible with today's new process equipment depend increasingly on control instrumentation.

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THE ELECTRICAL WEEK

The Issue's News Highlights . . . Budget Bureau reports plan to have private utilities supply power to TVA will not result in "dismemberment" of the federal agency. Langer committee releases testimony in hearings on proposed power contract with AEC.

GOP power and fiscal policies are shifting hydro development from federal to local responsibility . . . Local development of Priest Rapids site okayed by Senate . . . Stueck confirmed as member of FPC.

Twin ground-breaking ceremonies at the St. Lawrence Power Project will be held Aug. 10 on either side of the U. S.-Canadian border. The dam and two power plants of the joint project will be built between Cornwall, Ont., and Messena, N. Y. Ontario Hydro, which will build the project in partnership with New York Power Authority, has called for first construction bids.

Strikes and Settlements . . . Nine-day-old walkout ended at Ohio Edison as company and union agreed to a two-year contract with wage reopening after a year. Package averaged 8.65¢, including hourly increases of 4¢ to 8¢ plus fringes. During the strike, service was maintained by supervisory personnel.

At the request of Iowa's Gov W. S. Beardsley, IBEW-AFL postponed a strike against Iowa P&L to permit further negotiations with the company . . . Same union called off a threatened strike against Kansas City P&L, accepted an 8¢ pay hike . . . An arbitration panel recommended that West Penn Power and UWUA-CIO agree to a contract providing for a 6¢ boost in wages, 3¢ in fringe benefits.

First of 16 generators at Alcan's 1.7-million kva Kemano Project in British Columbia (EW, Jan. 21, 1952, p 32) went on the line last week. First pig of aluminum will be produced with power from the underground plant on Aug. 3.

Central Illinois Light Co is launching an "Ad-A-Wire" campaign, in which customers pay cost of wiring improvements through their electric bills. Terms are as low as $2 a month with three years to pay. The home owner executes a note to the contractor covering cost plus interest; contractor assigns note to the utility for collection.

Britain hopes to build "advanced" atomic power plants within 5½ years under a new program announced to Parliament. To implement the program, British Electricity Authority has established a nuclear power branch in its engineering department.

If you drop by to watch progress of New England Electric System's 150,000-kw hydro development on the Connecticut River near Littleton, N. H., the company gives you a membership card in its "Roadside Superintendents Club," urges you to use club's observation stand.

Off the Washington Wire . . . Joint Congressional Committee report on the atomic energy legislation carried sharp dissents on several sections of the long and complicated bill. Two committee members argued that provisions for licensing privately operated atomic power plants were inadequate. Chairman Sterling Cole, New York Republican, took exception to compulsory licensing of patents developed in the atomic power field. Outlook: the atomic energy bill will be passed, but only after extended debate.

Senate committee hearings into the proposed AEC-private utilities power supply contract (See page 6) were postponed last week, and are scheduled to resume July 21. Committee Chairman William Langer indicated he will hear private utility officials.

Senate approved construction of the Fryingpan-Arkansas reclamation-power project. Bill is now in the House.

First sodium-graphite reactor in the U. S. will be built jointly by Atomic Energy Commission and North American Aviation near North American's field test laboratory in the Santa Susana Mountains north of Los Angeles. The $10 million research plant will have no electric generating equipment.

Dr Charles D. Luke of Syracuse University has been appointed director of the AEC Office of Classification to succeed Dr James G. Beckerley, resigned.

Scared off by estimates that it would have to spend $1 million for two new units in the next 10 years, City of Bryan, Ohio, decided to become a customer of Toledo Edison instead. City built a substation and is buying 360,000 kwhr a month to augment its diesel system.

In Bluffton, Ohio, the Board of Affairs will open bids Aug. 9 on sale of its municipal system. Ohio Power for sure, Hancock-Wood Electric Co-op perhaps, will bid on the facilities.

First unit at Louisville's G&E's Cane Run Plant will be in service this fall. When all six 100,000-kw units in the plant, on the Ohio River below Louisville, are on the line, the station will generate 75,000 more kw than the company's total capacity today.

Federal Electric Products Co, Newark, N. J., changed its name to Federal Pacific Electric Co.

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Dixon-Yates Proposal Defended

Administration, nearing Congressional showdown, denies plan to shift power load to private supplier is an attempt to 'dismember' Tennessee Valley Authority

Administration forces moved in last week to defend the proposed shift of some 600,000 kw of Atomic Energy Commission power load from government to private power suppliers.

Bureau of the Budget, speaking for the White House, said the decision to relieve Tennessee Valley Authority of the big block of AEC load would provide for national defense needs and promote the best interests of the people in the area and in the nation.

The Budget Bureau statement disclaimed any attempt to "dismember" TVA. Instead, it said, TVA would carry less risk of being stuck with power surpluses should AEC loads be curtailed.

The 24-page Budget Bureau statement analyzed the two non-federal proposals for serving the AEC load (See below). From a dollars standpoint and for other reasons the bureau said it favored the one submitted by Edgar H. Dixon, president of Middle South Utilities, Inc, and E. A. Yates, chairman of the board of the Southern Co.

A second proposal offered by a syndicate headed by Walter Von Tresckow, a New York business consultant, was found inferior because of cost, lack of a standing organization, and for other reasons.

Showdown in the month-old controversy was sure to come when Congress begins debate on extensive revisions in the Atomic Energy Act. These revisions, which include provisions for broad industrial development of atomic power, would continue AEC's authority to make long-term power supply contracts of the type set forth in the Dixon-Yates proposal. TVA backers, hotly protesting the power shift, want to trim AEC contract authority to bar negotiation of Yates-Dixon contract.

While the power supply controversy was sure to delay final passage of the atomic energy measure, it was not expected to hold it up more than a few days.

Turning point in the contract controversy came July 9 when Democratic Sen William Fulbright of Arkansas, long a friend of TVA, presented a full-length defense of the Dixon-Yates proposal. Among other things, he asserted that AEC already is being overcharged by TVA and that valley residents are enjoying the subsidies.

Fulbright said TVA rates for sale of power to Memphis, Tenn., averaged 3.88 mills per kwhr while those to AEC under a standing contract is nearer 4.25 mills per kwhr.

Meanwhile TVA backers continued their constant barrage against the Dixon-Yates proposal as they had since it was ordered negotiated June 17. Tennessee Valley Public Power Association, representing retail power distributors in the valley, wrote President Eisenhower that a threatened power shortage in 1957 would be less of a burden on valley power users than would the Dixon-Yates contract.

Budget Bureau Compares Rival Proposals for Disputed

Cost Estimates

	Von Tresckow Estimate	Dixon-Yates Proposal	
(for 600,000 kw of demand, 5.2 billion kwhr per year)			
	Low	High	Firm Contract
Federal capital investment required for:			
Generating plant	none	none	none
Transmission lines	$10,156,000	$10,156,000	$9,840,000
Annual cost to federal government:			
1. Estimated base cost before taxes	19,196,000	20,922,000	19,070,000
2. State and local taxes	15,000	1,100,000	1,499,000
3. Federal income tax	.....	.....	820,000
4. Total, including taxes	19,346,000	22,022,000	21,389,000
Mills per kwhr	3.72	4.24	4.11
5. Credit for federal income tax	.....	.....	820,000
6. Net cost to federal government	19,346,000	22,022,000	20,569,000
Mills per kwhr	3.72	4.24	3.96
7. Possible increased cost (due to capital cost exceeding estimate)	20,977,000	23,653,000	20,854,000
Mills per kwhr	4.03	4.55	4.01
8. Sponsor's guarantee against further increase	none	none	contract guarantee

Comments on Dixon-Yates Proposal

1. By utilizing private utilities, the federal government will save a capital outlay of at least $100 million over the next three years, the cost estimated by Tennessee Valley Authority for the construction of equivalent capacity at the Fulton site.

2. The sponsors' proposal is a firm offer with a stated maximum capital cost reflected in the demand charge whereby a ceiling is placed on maximum liability on capital cost to the government. The sponsors bear one-half of any possible increased cost from an estimated cost of $107,250,000 to $117,000,000 and all the cost above $117,000,000. If the plant is built for less than $107,250,000 the government will share 50% of the saving.

Republican Rep John Phillips of California replied: "Do you recognize a similarity between the protests of the calf, who wants to continue his meals without working for them, and the protests of the TVA officials and their friends, who would like that favored agency of government to continue its carefree life, without the responsibilities and worries which face every private enterprise. . . ."

On the Senate side, the Anti-Monopoly Subcommittee under Republican Sen William Langer was preparing for another round of hearings in an effort to block negotiation of the Dixon-Yates proposal.

On the first round, the Langer group sought to show that private utilities had exerted pressure to block competing bids for the AEC power load.

Here are excerpts from the Langer hearing rearranged to give a chronological presentation.

JOHN LLOYD, JR, counsel for Atlantic City Electric Co: "If there is to be any publicity release in connection with this, we want our side of the story on the record at the same time. . . . If we can have assurance that there will be no press releases until we have had our day in court, we have no objection."

CHAIRMAN WILLIAM LANGER: "That certainly seems fair." [A few days later the transcript of the closed-door hearing was released to newspapers. Electric company officials had not appeared as of last week.]

Purpose of Hearing

SIDNEY DAVIS, Langer committee counsel: ". . . the focus and interest of this committee is not so much on the wisdom and legality of the Dixon-Yates proposals but rather on, first, the charges of attempts to hinder competitive bidding and to suppress competition, and, secondly, the broader problem of the long-term effect on the power industry in terms of monopolistic tendencies of the policy of having the Atomic Energy Commission enter the field of power development by contracting with private utilities for the construction of electric power plants to take over public power loads."

• • •

Von Tresckow Background

DAVIS: "Will you tell us briefly something of your business background and professional background?"

WALTER VON TRESCKOW: "I have been a consultant for the last 20 years. During that period, I have acted also as officer and director of the various financial companies, like Niagara Shares Corp as vice president and director; president and treasurer of Young & Ottley; as a partner in an engineering company; and also during the last three years and a half, consultant for the City of Burlington, Vt.

"Prior to that, I was an officer of the Central Hanover Bank and the Detroit Trust Co, which covers 30 years from 1904 to 1934."

• • •

Von Tresckow Financing Plan

DAVIS: Mr Burch (Lucius E. Burch, Jr, attorney for Von Tresckow) testified with regard to what he called, I believe, a new plan for the financing of power projects, which you originated. Can you briefly describe that plan to us?"

(*Continued on page* 10)

Atomic Energy Commission Power Supply Contract

3. There is no guarantee as to the ultimate capital cost of a Tennessee Valley Authority plant even though that agency has had a favorable construction record in recent years.

4. The proposal provides a guarantee and a real incentive on the part of the sponsors to assure that capital costs do not exceed $107,250,000. Thus, if the cost should go to $117,000,000, the return on $5,500,000 of equity capital would be reduced from 9% ($495,000) to 3.8% ($210,000). If the capital cost should exceed $117,000,000, return on equity capital would rapidly reduce to zero.

5. In addition, the plant is not completely amortized at the end of the 25-year contract. There is 24.6% of the debt not retired at the end of 25 years so the rate under the proposal does not provide for completely amortizing the plant over the 25-year period.

6. Acceptance of the proposal will help spread the risk in the event of future reduction in the AEC power requirements, which will in 1957 amount to about 30% of the TVA power supply.

Comments on Von Tresckow Proposal

1. Complete risk for all cost is assumed by the federal government and there is no ceiling on maximum liability except as may be covered by the performance bond previously discussed.

2. The estimates used are quite general and as far as can be determined are not based on any preliminary engineering studies or any firm commitments for fuel supply.

3. Realization of the estimates depends entirely on the ability and skill of the groups who will design, build, and operate. There are no other safeguards to insure reasonable limitation on costs.

4. The essential difference between this proposal and a direct appropriation to TVA is that a capital outlay by the United States of approximately $100 million, the cost estimated by TVA for construction of equivalent capacity at the Fulton site, would not be necessary. Under this proposal the capital would be provided by private issued bonds at 3½%, the full interest and amortization on which, together with a $4 million fee, would be ultimately paid by the government.

Local Responsibility—a GOP Keynote

Republican policies of last year and a half encourage hydro development by private enterprise, state and local bodies

Republican power and fiscal policies are taking hold—policies shifting water power development from federal to local responsibility. This is the conclusion you come to once you make a rundown of actions in Washington over the last year and a half.

To meet the challenge, private enterprise along with state and local bodies are moving to take up the slack in federal spending for hydroelectric development. When things get rolling, the Republicans hope to outstrip the old federally dominated development programs of the Democrats.

Once the Eisenhower Administration made it clear it was taking the wraps off local hydro development, local groups and electric companies began flocking into Washington to gain clearance for their own plans. By this week there were some sure signs that Republican policies are beginning to pay off:

- Local power groups—public and private—have filed for Federal Power Commission preliminary permits on proposed projects costing well over $1 billion. In terms of capacity involved, pending applications for FPC licenses jumped a whopping 42% from the first to the last six months of last year and are expected to increase at an even faster rate this year.
- Congress has cleared for construction by private industry a $100-million power development on the Coosa River in Alabama. FPC license is still needed.
- Congress has voted to let the federal government contribute funds for the flood control features of the Markham Ferry project in Oklahoma which is to be built by a Oklahoma's Grand River Dam Authority.
- Several other measures which would provide federal partnership or federal approval for locally financed projects have been approved by the House and are awaiting Senate consideration.
- With a reassuring nudge from the Eisenhower Administration, the $266-million St. Lawrence power project sailed through FPC and gained quick approval from the federal courts.

Much of the expanded activity in hydroelectric development stems from Republican policies and actions beginning as far back as the campaign of 1952. At that time candidate Eisenhower promised to place more emphasis on the local community role in resources development.

Interior Department, with the President's backing, put the policy in writing in August of last year:

"In general, it (the department) will not oppose the construction of facilities which local interests, either public or private, are willing and able to provide in accordance with licenses and other controls of the Federal Power Commission or other appropriate regulatory bodies and which are consonant with the best development of the natural resources of the area."

This policy had been earlier incorporated in Interior's decision to step down as a special pleader for federal construction of the controversial Hells Canyon project in Idaho. This decision gave Idaho Power Co a boost in seeking an FPC license for its proposed 3-dam development of the Hells Canyon site, and served notice that

Republican Power Policy Shift—from Federal to Local Hydroelectric Development

Project	State	River	Capacity (kw)	Cost (millions of dollars)	Status
St. Lawrence	N. Y.	St. Lawrence	940,000	266	License granted; financing under way.
Coosa River Basin	Ala.	Coosa	239,000	100	De-authorized by Congress. Preliminary permit applied for.
Markham Ferry	Okla.	Grand	70,000	30	Federal participation voted.
Hells Canyon (3 dams)	Idaho	Snake	783,400	133	License applied for. Hearing completed.
Buffalo	Mont.	Flathead	60,000	.....	Preliminary permit applied for.
Cougar	Ore.	McKenzie	35,000	34	House votes federal participation. Bill in Senate.
Priest Rapids	Wash.	Columbia	1,590,000	.....	De-authorization voted by House and Senate.
Boundary	Wash.	Pend Oreille	570,000	170	Preliminary permit applied for.
Rocky Reach	Wash.	Columbia	910,000	265	Preliminary permit applied for.
Bruces Eddy	Idaho	Clearwater	244,000	117	Preliminary permit applied for.
Penny Cliffs	Idaho	Clearwater	292,000	191	Preliminary permit applied for.
Wells	Wash.	Columbia	588,000	171	Preliminary permit applied for.
Upper Baker (Engletrout site)	Wash.	Baker	60,000	.....	Preliminary permit applied for.
Chiwawa	Wash.	Chiwawa	10,000	.....	Preliminary permit applied for.
Leavenworth	Wash.	Wenatchee	135,000	.....	Preliminary permit applied for.
Sultan	Wash.	Sultan	60,000	.....	Preliminary permit applied for.

Interior was no longer seeking to monopolize hydro sites as it had under previous Democratic Administrations.

The Republicans implemented this policy in still another way—by drastically trimming federal appropriations for water power development. The Truman budget for TVA, for instance, was chopped from $239.4 million for construction to $178.4 million last year and down to $120 million for the current fiscal year.

In a similar manner, Bureau of Reclamation construction funds were trimmed from $193.8 million under the Truman budget to $116.3 under the Eisenhower budget and Congressional cuts. Congress and the President upped the figure slightly for the current fiscal year.

Corps Budget Trimmed

Multipurpose projects of the Corps of Engineers received somewhat the same treatment. The Truman Administration early last year asked for $327 million for construction of such projects during the fiscal year which ended June 30 of this year. The Administration cut the request to $238 million and Congress snipped it to $215. For the present fiscal year, Congress has voted $207 million for continued construction of these projects.

Armed with assurances that the federal government would not longer compete with local and private interests in hydro development, local interests stepped in to file license and preliminary permit applications. Where legislation was needed, bills were started through Congress.

Among the first acted on was the bill de-authorizing the Coosa River basin power development by federal agencies, and permitting the Alabama Power Co to build this $100-million project.

Legislation providing for this de-authorization was introduced early this year by eight of Alabama's nine Congressmen. After a one-day hearing, the bill sailed through Congress.

Under terms of this bill FPC is permitted to license Alabama Power to build a series of five new dams on the Coosa for flood control and power production. Installed capacity of the five projects will be around 239,500 kw and all five are to be built within ten years after a license is issued for the first one.

If and when a license is issued for

(Continued on page 55)

FREDERICK STUECK testifies before Senate committee prior to approval as member of FPC

Stueck Confirmed for FPC Post

Approval of St. Louis lawyer gives the commission its first Republican majority since 1932

Confirmation of Frederick Stueck as a member of the Federal Power Commission gives that body a Republican majority for the first time since 1932.

Stueck took the FPC oath of office July 9 joining fellow Republicans Jerome K. Kuykendall, chairman, and Claude Draper, dean of FPC. Still another member of the commission, Nelson Lee Smith, leans toward the Republican philosophy but insists on retaining his label as an independent. Lone Democrat on FPC is Seaborn Lee Digby.

No Opposition . . . There was no opposition to the Stueck nomination. Senate hearing preceding his confirmation required less than 15 minutes. The two Missouri senators, both Democrats, gave their endorsement to the St. Louis Attorney. He took office just ten days after being nominated by President Eisenhower.

The new Federal Power Commissioner is a former chairman of the Missouri Public Service Commission, having served in that post from August 1941 until October 1943. He left to enter the military service as an Army enlisted man. He presently holds a commission as captain in the U. S. Army reserves.

After separation from military service in June of 1946, Stueck became manager and later vice president in charge of operations of Transit Casualty Co, an insurance company specializing in mass transportation risks. He resigned in January 1950 to re-enter law practice.

Assisted Governor . . . Previous to becoming chairman of the Missouri commission, Stueck was an executive assistant to Gov Forrest C. Donnell of Missouri.

Langer Hearing on Power Contract

(*Continued from page* 7)

VON TRESCKOW: "When examining the problem of the City of Burlington, Vt., in developing the solution for low-cost power for the future, it became obvious to me that no serious cuts in the cost of power could be made by private public utilities unless they got away from an insistence on a 6% yield on invested capital, and the resulting 10% profit therefrom. An examination of the power business showed that of all the businesses in the country, it had the least risk, because of its continuous growth."

"Secondly, that it had a guaranteed income, because on the average, the invested capital is guaranteed 6%, and that the common stock equity received about 10% from that.

"In our examination we thought that had grown to be too much, and we developed a formula which would satisfy private investors which required only 2.4% on invested capital, and provided for the repayment of all debt incurred in the construction of the generating station, the net result of which is that power can be produced according to this formula anywhere in this country 25% cheaper than it is being produced now by private companies."

SEN ESTES KEFAUVER: "By private companies?"

VON TRESCKOW: "Yes, by private companies. The formula will produce power in the TVA area at approximately the same cost as the TVA does."

The testimony shows that Von Tresckow hired Burch, a Memphis attorney, in connection with pushing this proposal as an alternative to TVA's proposed proposed Fulton plant. The engineering firm of Gibbs & Hill, Inc was referred to by Von Tresckow as the engineering firm for his syndicate. The firm, however, disassociated itself from the Von Tresckow TVA proposal.

KEFAUVER: "That did leave you in considerable lurch then, in a very bad situation, with a conference coming up with the Atomic Energy Commission, and the engineers were out?"

VON TRESCKOW: "It sure did."

KEFAUVER: "And what did you do then?"

VON TRESCKOW: "Well, it was disaster, almost, because the Atomic Energy Commission insisted on engineers. . . ."

The Gibbs & Hill Story

DAVIS: "Were you hoping to be in on any construction that might possibly be undertaken by Mr. Von Tresckow in this connection?"

DAVID B. SLOAN (president of Gibbs & Hill): "Which? in the TVA?"

DAVIS: "Yes."

SLOAN: "We didn't know. We didn't know enough about the situation to come to any conclusion in the matter. You are talking now back prior to April 2, I trust."

DAVIS: "Weren't you thinking more or less, Mr Sloan, that if this should eventuate—it might be a pipe dream—but if it should eventuate that this was a big job and you would like to be in on it?"

SLOAN: "I think that it is a fair statement."

DAVIS: "Therefore, you wanted to be helpful in, at least, as you regard this, very preliminary state?"

SLOAN: "I think that is right, yes."

[After Gibbs & Hill had been associated in newspaper and magazine stories with the Von Tresckow proposal, Sloan talked with Von Tresckow.]

DAVIS: "Mr. Von Tresckow called you, sir, and you told him at that time that you did not want to get involved in any publicity?"

SLOAN: "I told him, as far as I was concerned, we did not want our name used in connection with this project, and that I would talk to my associates and would call him again, which I did, and we went up to see him. Mr [Edward L.] Champion and [Mr John B.] Saxe [Gibbs & Hill vice presidents] and myself went up to Mr Von Tresckow's apartment."

DAVIS: "What was the occasion of your visit? What led you to see him?"

SLOAN: "The fact that in spite of our asking that our name not be used in connection with this project in a number of publications and it had come to the attention of a number of people, and we wanted retractions printed in such papers and periodicals as the statement appeared and we went and also at that time, in view of everything that had transpired to write a letter pressing our position."

(*Continued on page* 52)

TECHNICAL NOTES

ARCHER E. KNOWLTON

Two conductors of different circuits in an iron pipe will behave like a 1-to-1 transformer; each will reflect its own voltage drop to the other.

Test-out should be started earlier than has been customary because modern stations involve more instrumentation, more controls, more interlocks.

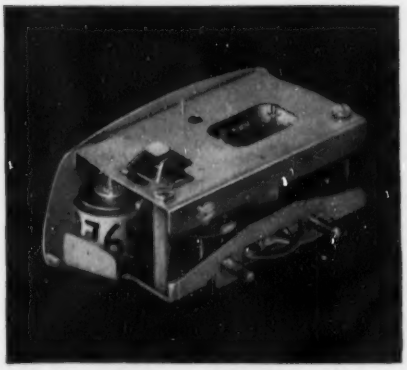
Outdoor plant working conditions during overhaul can be more favorable than in an indoor plant up to as much as 75% of the time. Light, air, and elbow room are superior.

Permissible iron content of commercial copper used in magnetic instruments might be enough to affect seriously the magnetic response.

Loss of field by a generator operating at high power factor without voltage regulators on a tightly knit system is likely to result quickly in system instability unless the machine is immediately disconnected.

Horizontal spacing between submarine cables laid simultaneously should be 5 to 10 ft, the range increasing if water is swift.

Westinghouse Cyclometer Register Easier to Read



Precision workmanship and sturdy construction identify the Westinghouse cyclometer register for CS and CA meters.

Larger numerals on a permanent white background give this improved Westinghouse cyclometer register far superior readability. Partially obscured figures have been eliminated by providing for "jump" advance of all four drums.

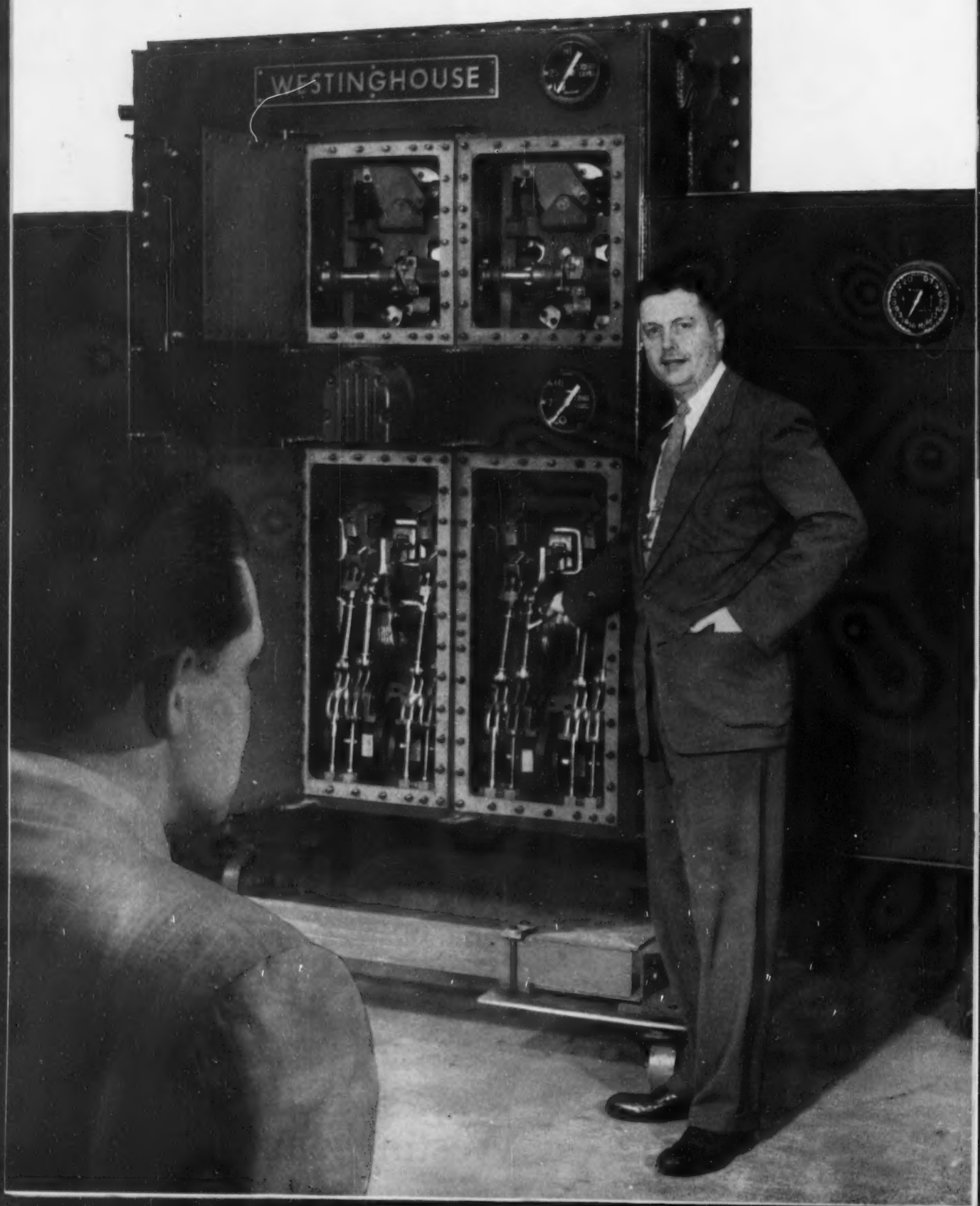
The cyclometer register shown can be supplied on all Type CS and CA meters and is interchangeable with all registers previously used on these meters. The register resets quickly and easily. All gears are precision milled for accuracy . . . and gold finished for corrosion protection.

Your Westinghouse representative has additional information on the new cyclometer register. Ask him for a copy of B-5846-A or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40478

YOU CAN BE SURE...IF IT'S

Westinghouse

setting the pace of transformer design for the industry



NEW URT TAP CHANGER . . . THE MOST DURABLE EVER BUILT!

300% more fault capacity
200% faster arc quenching

The new Westinghouse URT Tap Changer, for 15,000 through 100,000 - kva power or regulating transformers, combines the rugged construction and proven direct-drive mechanism of the superseded UNR with new features to provide you with the longest, trouble-free service, yet. For instance—

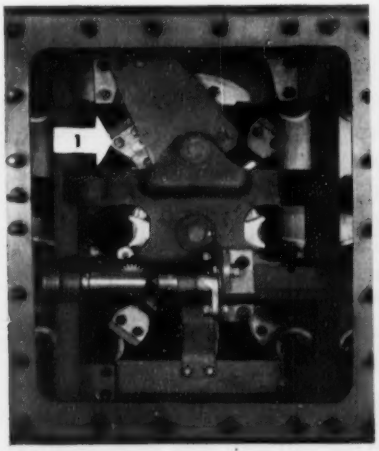
New contact design on the moving contacts of the selector switch and main stationary contacts of transfer switches provides 300% greater current-carrying capacity for operation under fault conditions. It accomplishes this through magnetic attraction between two spring-loaded copper bars with coin silver contacts. Proper contact is maintained for normal loads and as fault current value increases, magnetic attraction between the bars increases contact pressure as needed. Spitting—hot spots—contact welding are thus eliminated.

New arcing switch for the transfer switch assembly decreases arcing time, for example, from a full cycle to one-half cycle—an improvement of 200%. A double-butt arcing contact, with an arcing chamber and magnetic "blowout", makes this possible. The inserts of the main arc tips have a greater than ever life potential.

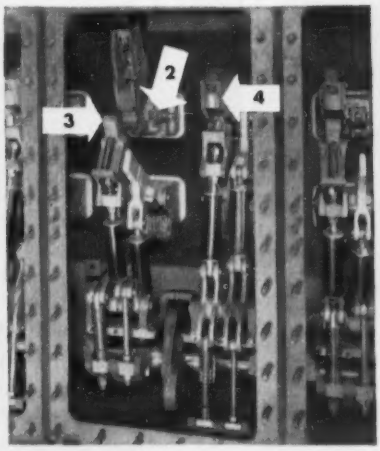
The new URT simplifies inspection, too. Each selector and transfer switch has its individual door—held with stud protecting cap nuts. No more reaching around or through other phase units.

This TCUL development, and the many preceding it, is tangible evidence of the Westinghouse tradition in setting the pace of transformer design for the industry. For more information call your nearby Westinghouse Representative or write Westinghouse Electric Corp., 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

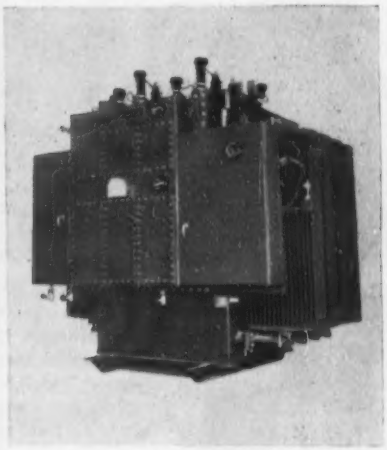
J-70733



300% greater fault-current capacity in this selector switch moving contact (1), and main stationary contact of the transfer switch (2), through principle of magnetic attraction.



200% faster arc quenching is provided by the combination of a double-butt arcing contact (3), arcing chamber and magnetic "blowout" (4) ... for increased contact life.



Note single, compact housing for all components of the URT. Front-operated demountable doors individually house all selector and transfer switches.

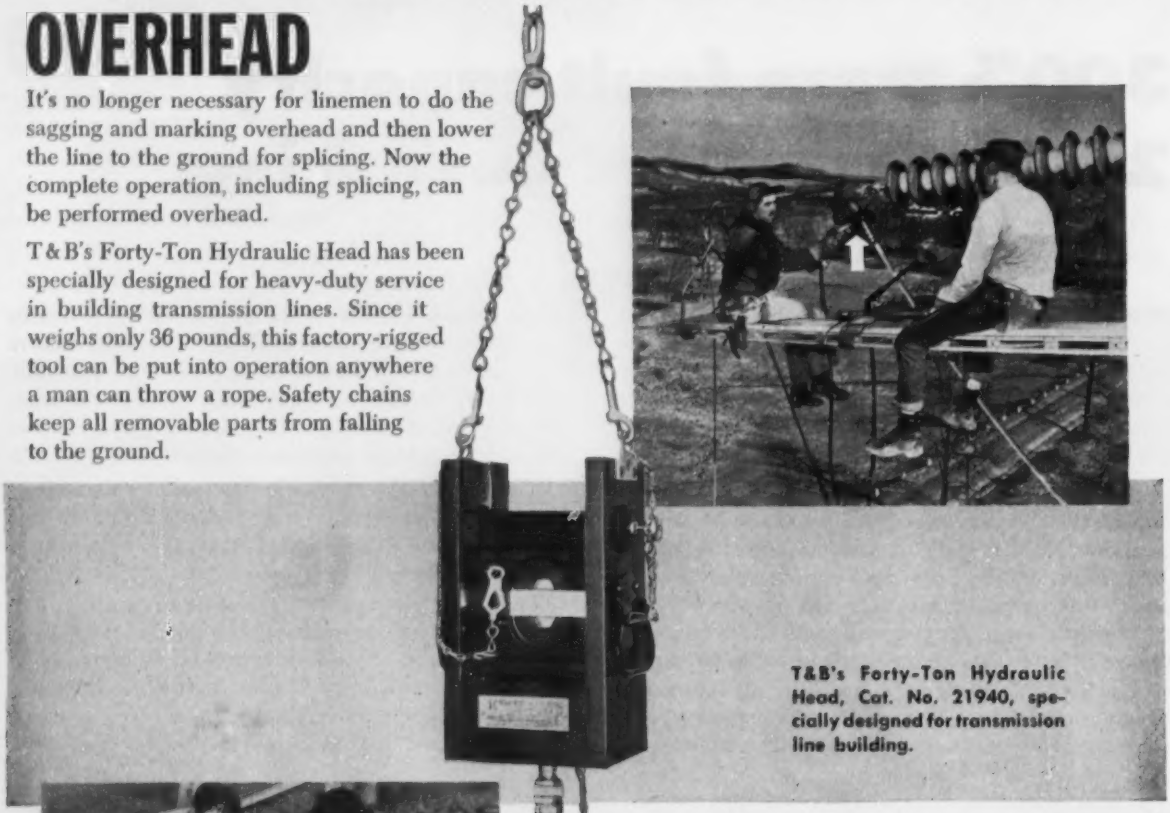
YOU CAN BE SURE ... IF IT'S
Westinghouse

Now *ONE* portable tool makes transmission line splices

OVERHEAD

It's no longer necessary for linemen to do the sagging and marking overhead and then lower the line to the ground for splicing. Now the complete operation, including splicing, can be performed overhead.

T & B's Forty-Ton Hydraulic Head has been specially designed for heavy-duty service in building transmission lines. Since it weighs only 36 pounds, this factory-rigged tool can be put into operation anywhere a man can throw a rope. Safety chains keep all removable parts from falling to the ground.



T&B's Forty-Ton Hydraulic Head, Cat. No. 21940, specially designed for transmission line building.

or ON THE GROUND

Demountable legs hold T & B's Forty-Ton Hydraulic Head at convenient working height when installations are being made on the ground. During operation, hardened steel dies compress fitting and cable hexagonally into one homogeneous mass . . . all in a few seconds. The same die set installs tension splicers, dead ends, loop splicers and taps, tees and terminals.

Modern hydraulic design has virtually eliminated the need for maintenance. However, field maintenance is simple and practical. The 21940 Installing Head can be completely disassembled and reassembled in less than one-half hour with these common tools: screw driver, Allen wrench, and mallet.

T&B Bulletin 70 gives a detailed description of the Forty-Ton Hydraulic Head as well as complete lines of T&B connectors, tools, and accessories for transmission line building. Send for FREE copy.

LOOK FOR THIS SIGN —

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-418

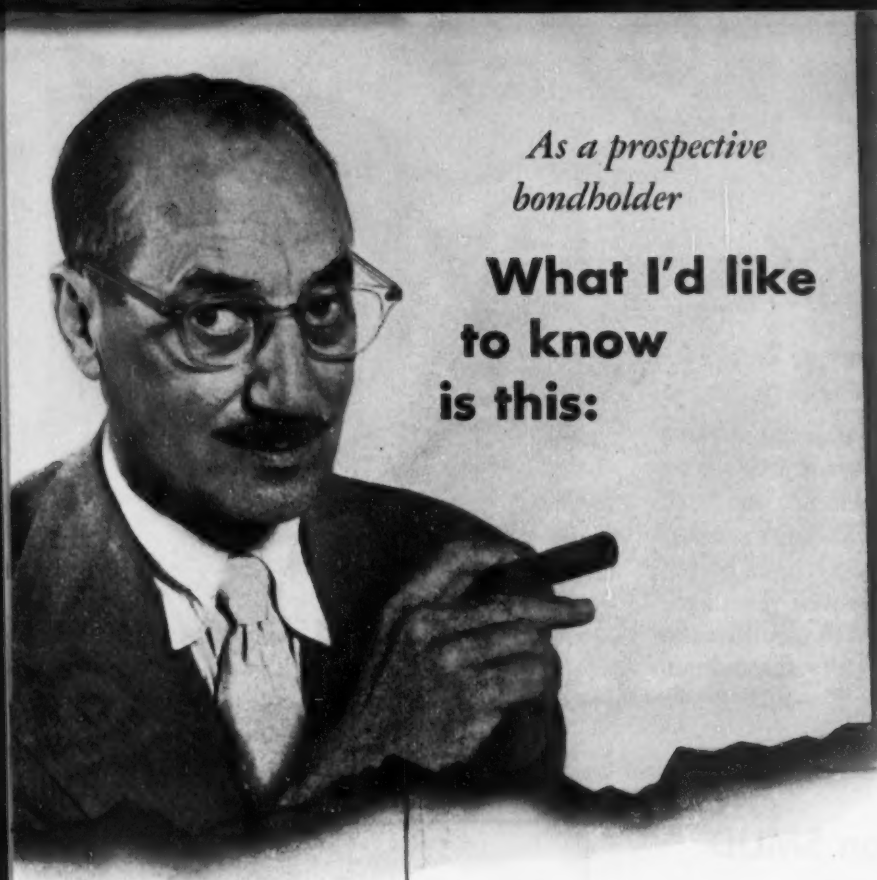
THE THOMAS & BETTS CO.

INCORPORATED

14 Butler Street • Elizabeth 1, New Jersey

Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898



As a prospective bondholder

What I'd like to know is this:

"What kind of a business am I getting mixed up in anyway?"

The electric power business. The Sacramento Municipal Utility District, or "SMUD" as we are called, supplies electric power to 109,000 customers in an area of about 650 square miles comprising most of Sacramento County in the heart of California. The District's electric system is owned by the public it serves and is locally managed. It is entirely self-supporting, receiving its revenue fro[illegible] purpose

presently compose the District's board of directors are pictured on page 28 of this report.

"Tell me, how does one get into this [illegible] By election. Each direct[illegible]

Groucho Gives SMUD the Treatment

. . . and bondholders of the California utility get a lively annual report as a result

Here's how it was done ➡

"What does the SMUD public get out of all these shenanigans?"

Lower rates, for one thing. Since January 1, 1947, the District has made two major rate reductions and several minor revisions, all of which have reduced SMUD's present rates to a level approximately 10.2% below the level of rates in effect seven years ago. In the meantime, the rates of electric utilities have increased generally throughout

mately $3,696,20

Groucho checks up on SMUD

What Groucho Marx wants to know (see page 15) is aptly told bondholders of Sacramento Municipal Utility District in the fanciful 1953 annual report written by SMUD's Al Hamilton. Pages from the report are reproduced here—they're shot full of facts and laughs. Take this bit of frippery, from Page 21:

"I peeked at your statement on page 23. *What's this item, 'intangible plant'? Some delicate tropical flora?"* It's a tongue-twister, all right, but it is a . . .

"I once knew a girl named Flora, but she wasn't very delicate." It is an accounting term which frequently is used in financial statements to include . . .

"Flora wasn't delicate but I think she came from the tropics." . . . to include costs related to the organization of an electrical system or the acquisition of properties which cannot properly be classed and treated in the same manner as properties which have physical substance . . . *"Really?"* Really.

And then on page 17 SMUD gets to talking about the liberal employee benefits it has installed, only to be brought up sharp by a typically snide remark: *"Are they all vice presidents at SMUD or do some of them work?"* Indeed they do, says the utility's Boswell; even some of the VP's.

"Enough of this encomium," says Groucho. *"Are you making any money?"* During 1953, SMUD's man tells him, net revenue from the system amounted to $2,686,653, second highest in the District's seven-year history. *"You mean this is what you took away from your customers last year?"* That's right, Groucho. During the past year SMUD sold a total of 659,664,000 kwhr to an average of 106,655 customers, replies annual report writer Hamilton.

—And the secret word is "promotion".

"Now you're getting around to me. If I buy your bonds, what will my money be spent for?"

It will be spent principally to bring in new sources of electric power supply for the growing Sacramento area. During 1954 and 1955 the District will construct the high-voltage transmission and delivery facilities described earlier to take power directly from the Central Valley Project's main transmission line, which runs right past Sacramento, and to bring this power to the District's system load centers at the proper voltage. Expenditure of a total of $6,500,000 for this purpose will put to use virtually all of SMUD's system construction fund which, over the years, has been accumulated to meet just such a need. Any

"Do you mind telling an old coupon clipper what you're doing to meet competition from the local gas company?"

Not at all. The Sacramento area is supplied with low-cost natural gas and this fuel competes with electricity in many cases. SMUD's sales promotion program is planned to point out to its customers those uses where electricity provides greater ef-

motion is directed by an electrical develop-
ment group which devotes its entire time

"You mean you're going to need more watts to kill?" That's about the size of it. SMUD is presently engaged in engineering exploration of a suitable site for a steam electric generating plant and has also filed

Groucho's affably acid personality put across this annual report story in an unusual and effective way. Even Groucho (so SMUD says) was reasonably convinced

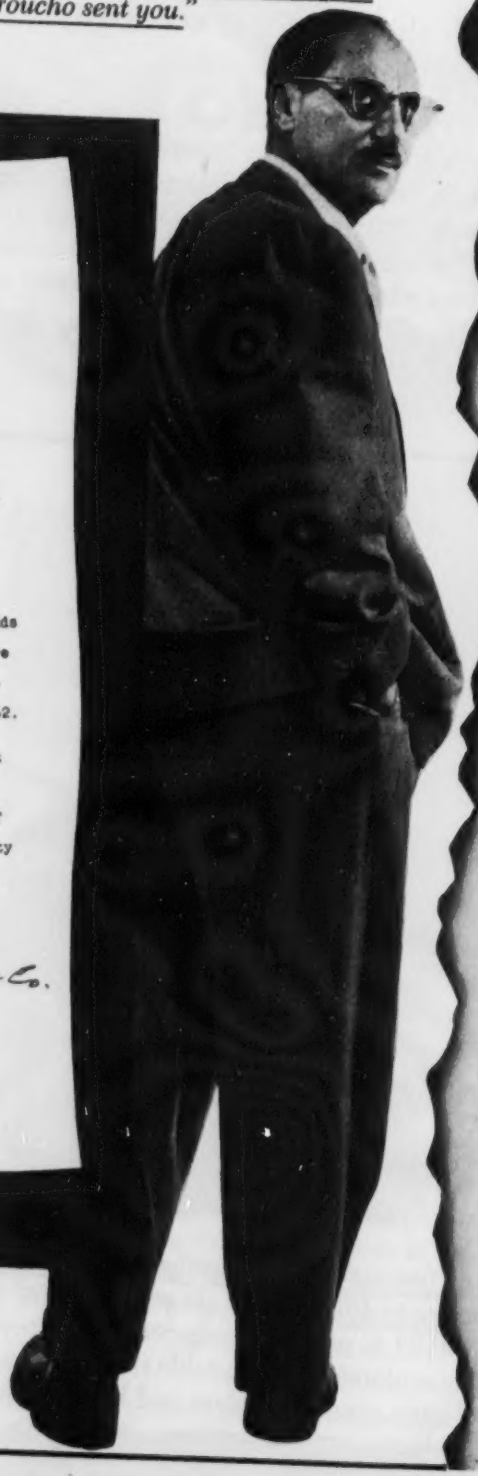
—turn the page to see

Serious 'pitch' came at the end, tied in with the accountant's certificate

engaged for the past six years for this audit work.

"*Really?*" You bet your life!

"*Well, this has been most interesting. Perhaps I'd better keep an eye on you for the next few years. When you're ready with that expansion program you told me about, go down and see my banker. And tell him Groucho sent you.*"



ARTHUR ANDERSEN & Co.
ACCOUNTANTS AND AUDITORS

405 MONTGOMERY STREET
SAN FRANCISCO 4

To the Board of Directors of
Sacramento Municipal Utility District:

We have examined the balance sheet of SACRAMENTO MUNICIPAL UTILITY DISTRICT as of December 31, 1953, and the related statement of net revenue for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances. Power bonds outstanding at December 31, 1953 (for which there are no trustees) were confirmed by direct correspondence with the paying agent. We had previously made a similar examination for the year ended December 31, 1952.

In our opinion, the accompanying balance sheet and statement of net revenue present fairly the financial position of Sacramento Municipal Utility District as of December 31, 1953, and the results of its operations for the year then ended, and were prepared in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Arthur Andersen & Co.

San Francisco, California
February 5, 1954

it's time for a new meter...

when Mrs. Forbes...

gets her automatic laundry

Better look at the Forbes' meter—it's probably inadequate. It was never designed to measure a load like this. It may run slow on heavy loads, or it may burn out.

The Sangamo J2, the meter with straight-line accuracy up to 100 amperes, will prevent lost revenue. The J2 has adequate capacity to carry 100 amperes continuously without overheating and sufficient torque to accurately measure even the lightest load.

The J2 is *the* slow-speed meter that makes fewer revolutions per kilowatt-hour—bearings last longer.

When you buy new meters to handle today's growing use of electricity, protect your investment by choosing a meter with plenty of reserve capacity for continuously growing loads.

Choose the new Sangamo J2—the first . . . and finest . . . 15 ampere meter with 100 ampere capacity.

A METER WITH STRAIGHT LINE ACCURACY

UP TO 100 AMPERES

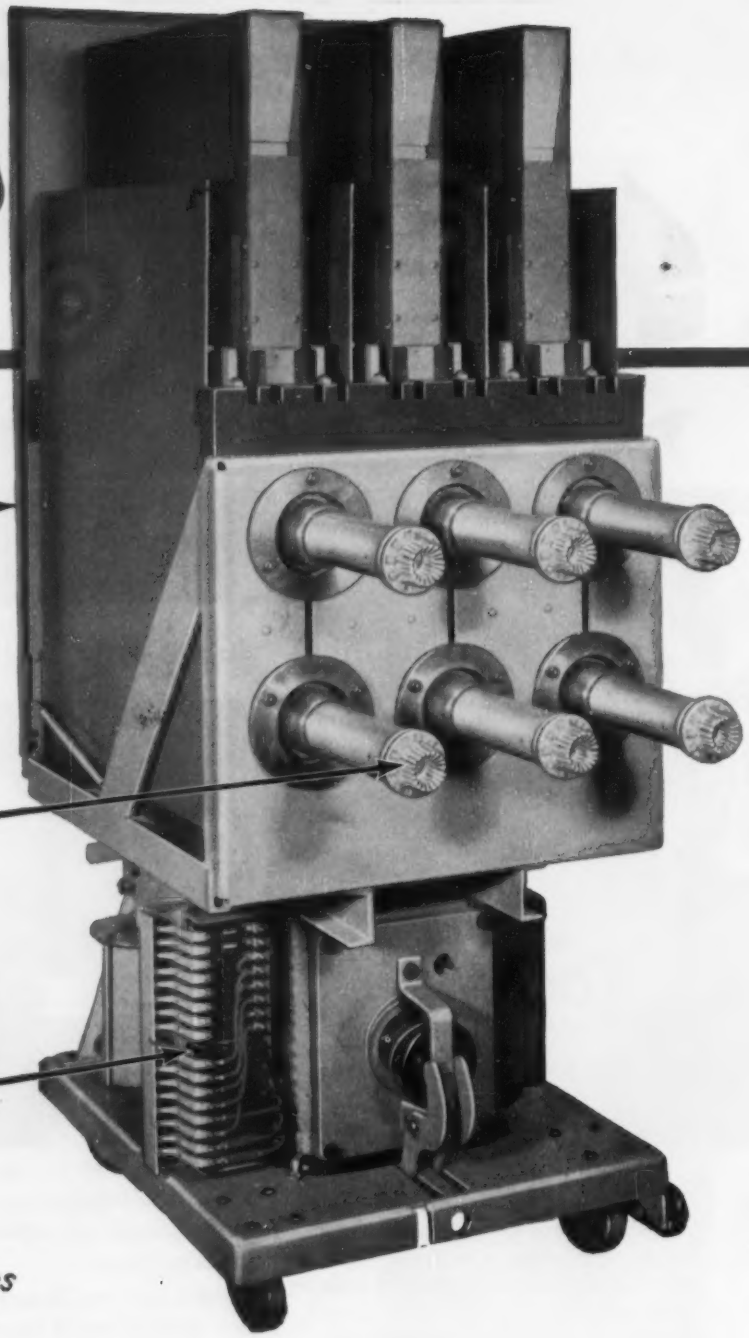
SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

IM54-6

ALLIS-CHALMERS

PROGRESS IN

Switchgear



Safety first!
Steel panel in front completely seals off high voltage members

Primary contact fingers are on bushing of movable portion ...easy, safe to inspect

Secondary disconnects are direct-connected to auxiliary switches- eliminating wiring

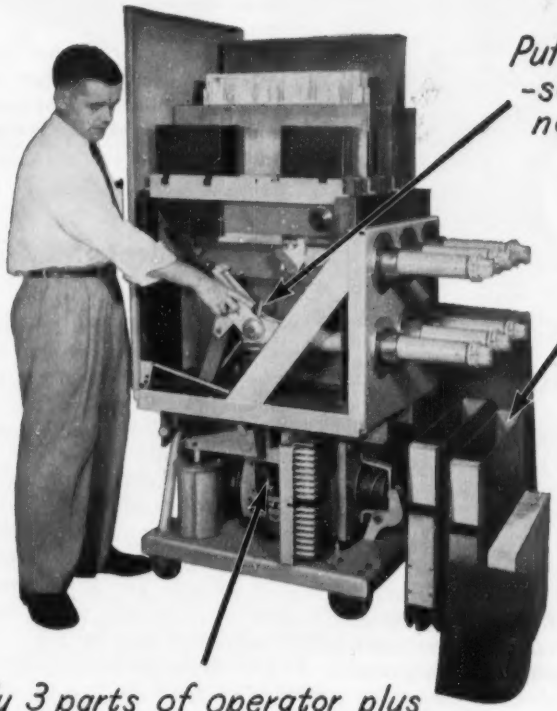
Shorter interrupting times for low currents

For additional information on this outstanding new breaker, call your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4175

ALLIS-

engineering notes on

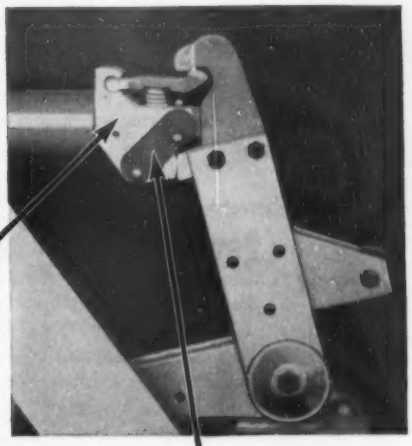
New 13.8-Kv Breaker



Puffer at ground potential -separately mounted- not on moving part

Each part of arc chute assembly is separately movable and can be conveniently handled by one man

Only 3 parts of operator plus armature move on closing operation: latch and trip-free link plus 3 parts of operator move during opening

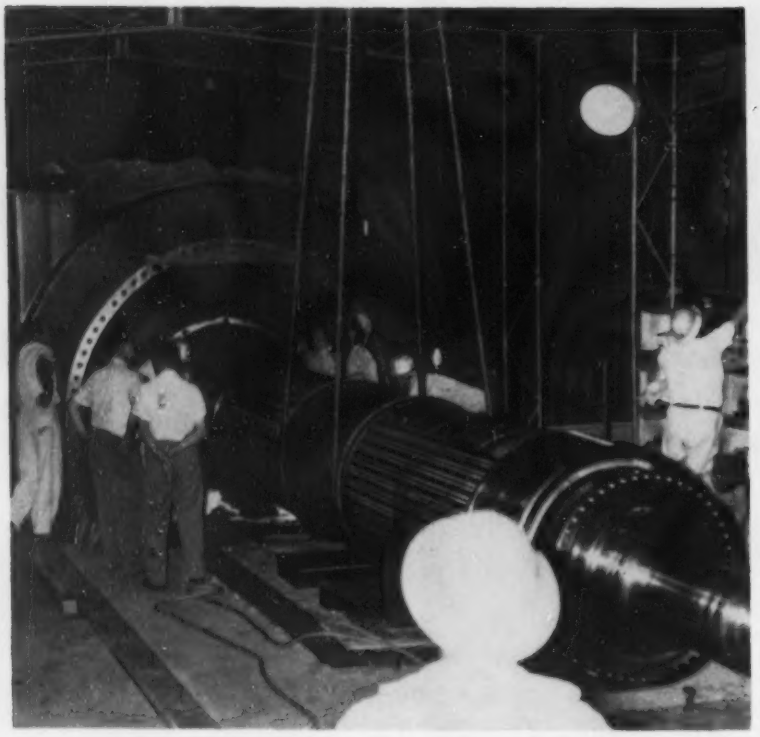


Contacts are blow-on type. Magnetic field is arranged so that contact pressure increases as current increases

Access to contacts may be made by removing this insulated cover

CHALMERS

A-C ALLIS-CHALMERS



Maneuvering Rotor into Position

Arizona Public Service Co workmen maneuver an 83,000 lb generator rotor into position at the company's new steam generating plant at Redrock, between Phoenix and Tucson. The rotor was sent by special flatcar from Schenectady, N. Y. The first 100,000-kw generating unit of the Saguaro plant is scheduled to be placed in service next month.

FPC Estimates Only 20% of Hydro Power Developed

Recently released report of Federal Power Commission estimates that hydroelectric power resources available for possible future development in the U. S. total about 88 million kw.

Total power resources in the nation, both developed and undeveloped, are placed at about 109.5 million kw. Of this amount, according to the report, 21.5 million kw, or 20% of the total figure, are now developed.

The FPC report is entitled "Hydroelectric Power Resources of the United States, Developed and Undeveloped, January 1, 1953."

The report groups river basins of the country into 14 major drainages and states into 9 geographic divisions. Under these groupings, 44% of the nation's developed hydro power is on streams west of the Continental Divide. North Pacific drainage contains 23% of the U. S. total of developed hydro. The Mississippi River basin, which takes in four major drainages, has an aggregate hydro power installation of 5,659,275 kw at 362 plants, the largest total installed capacity of any single river system in the country.

State area having largest aggregate development is the Pacific Division (Washington, Oregon, and California) with 6,842,389 kw, representing 32% of the U. S. total.

According to the FPC report, about 54% of the undeveloped hydro resources are in river basins west of the Continental Divide. The North Pacific drainage, including the Columbia River basin, has largest amount of undeveloped power—33,994,000 kw. Next comes Mississippi Basin with 21,686,600 kw.

Copies of the report may be purchased from Publications Division Federal Power Commission, Washington 25, D. C. Price is $1.50 a copy and the order number is FPC P-26.

Computation Center Opens Near Princeton

First analog computation center, available to industry on a rental basis, was opened July 14 near Princeton, N. J., by Electronic Associates, Inc.

The center is equipped with an electronic analog computer. Dual control console and related equipment permits the simultaneous solution of two problems or the use of the entire facility to solve more complicated problems. Among types of problems that can be solved by the computer are those involving transmission line analysis.

Customers may set up their problems themselves, either at their own plant or at the center, by using special problem boards available for that purpose.

Seattle Residents May Get Choice on Light Poles

Residents of Seattle will be able to choose between wooden or steel light poles in various districts of the city, if plans of City Light and the city engineering department are accepted by the City Council.

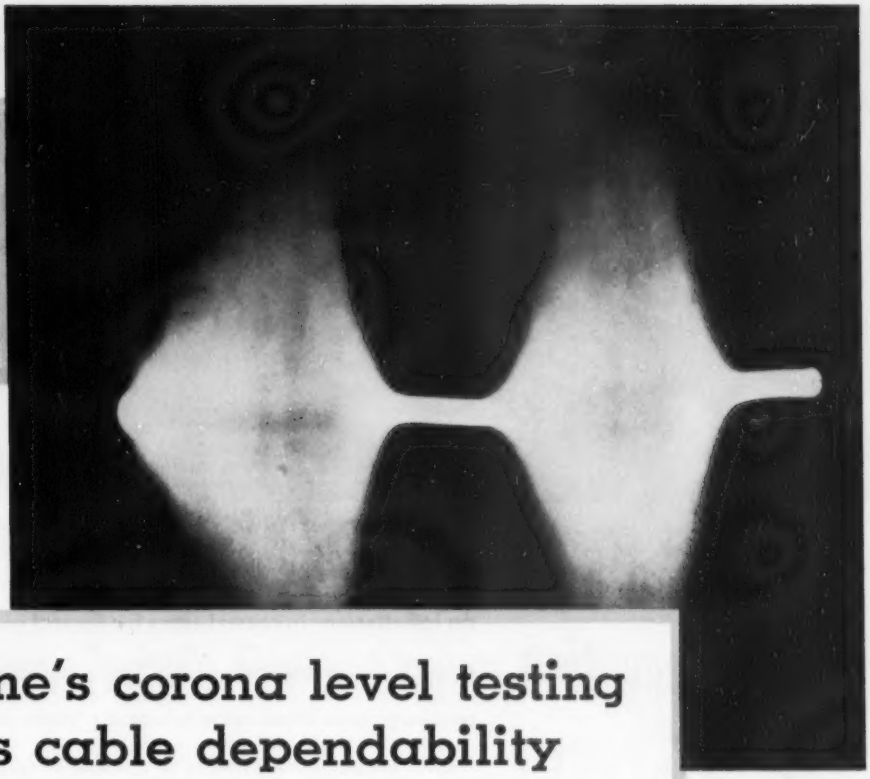
The city is considering a policy which calls for illuminating all usable streets, a total of 1,020 miles, within the next five years, at a cost of more than $4 million. The project would be financed principally with a bond issue to be voted upon this fall.

In general, the improved residential street lights would be on wood poles to save expense but residents in districts desiring something better could get it by paying the added cost, probably through formation of a Local Improvement District. Costs are estimated at $168 for installing a mercury-vapor lamp on an existing wood pole, $224 on a new wood pole, and $560 on a new steel pole with underground wiring.

Solar Energy Parley Set

The executive committee of the Association for Applied Solar Energy has set a tentative date of October, 1955, for a worldwide symposium to be held at Phoenix, Ariz. Meeting originally had been scheduled to be held Jan. 12-15 of next year (EW, June 7, p 50).

Specially designed ionization detector for routine factory use measures corona level of all-insulated cables rated at 3000 volts or over.



Why Rome's corona level testing assures cable dependability

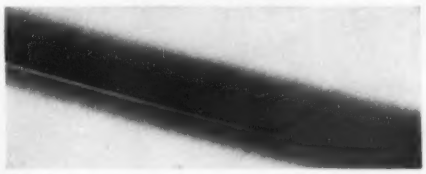
The picture above means trouble. It is an oscilloscope trace of internal ionization in an insulated cable.

Ionization is caused by the electrical break-down of air in pockets within the insulation, or between the insulation and conductor or shield. Should this ionization occur at a value below the operating voltage of the cable, several destructive electrical effects may occur such as possible ozone cutting, reduced dielectric strength, and a substantial increase in dielectric losses. Any of these hazards could result in early failure or reduce the efficient performance life of the cable.

Ionization is particularly dangerous because it cannot be detected by the ordinary visual, physical and electrical testing methods usually applied to cable.

So, to prevent guesswork, to assure you of maximum protection against ionization, *every foot of Rome insulated cable, rated at 3000 volts or over, is thoroughly tested by a specially designed ionization detector.* This instrument accurately measures the corona level of the entire cable. Unless the ionization voltage exceeds the intended operating voltage of the cable, the cable is rejected.

This is one more extra step in Rome Cable's standard manufacturing procedure that assures dependability. This completely new *NONDESTRUCTIVE* method of testing was developed by Rome Cable engineers and was first described in AIEE paper 48-198, "The Measurement and Investigation of Ionization Level of Rubber Insulated Cables," presented in August, 1948.



This X-ray reveals loose insulation—a major cause of ionization.

500,000 CM stranded single conductor RoZone insulated, shielded, RoPrene sheathed power cable . . . 15,000 volts, grounded neutral.

ROME CABLE Corporation
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A DISTRIBUTION ENGINEER ASKS—

No. 6 IN A SERIES

"How can we reduce transformer bushing flashover caused by air-borne contamination?"

It can be done quickly, easily and economically simply by installing Pinco L5206 Fog Caps.

here's the answer:

As a matter of record, these Fog Caps have been in use on installations in coastal areas for several years and are now finding popular acceptance wherever "fog" conditions exist—particularly in those areas where air-borne industrial and chemical wastes are a constant source of trouble to transformer efficiency.

So if you are confronted with a similar problem, then the Pinco L5206 Fog Cap is the "idea" that will help you to eliminate costly and annoying "outages." Available in various sizes to meet your requirements. Drop us a line . . . we'll be glad to give you complete details.

FEATURES OF THE PINCO L5206 FOG CAP

1. PROTECTS upper part of bushing from contamination; also keeps it dry, thereby maintaining an effective leakage path.
2. ELIMINATES annoying service interruptions caused by bushing "flashover."
3. EASY TO INSTALL on present equipment. Just remove bushing terminal and place PINCO L5206 Fog Cap in position and replace terminal. Cap is equipped with coroprene gasket.

The Porcelain Insulator Corporation
LIMA, NEW YORK

Write us for complete information or contact the Joslyn Mfg. & Supply Co. office in your locality

PINCO INSULATORS
RIGHT ON THE JOB—

TECHNICAL PROGRAM and inspection trips are previewed by Ernest K. Sadler, vice-chairman, AIEE president Elgin B. Robertson, and Bradley Cozzens, chairman of the general meeting committee. The technical program listed 239 papers

AIEE Views Today's Power System Problems

The changing complexion of utility systems and the impact of problems posed by growth upon the technology of power systems operation and engineering were clearly reflected in the deliberations at the summer general meeting of the American Institute of Electrical Engineers. Some 2,500 engineers attended the meeting held June 21-25 at Los Angeles.

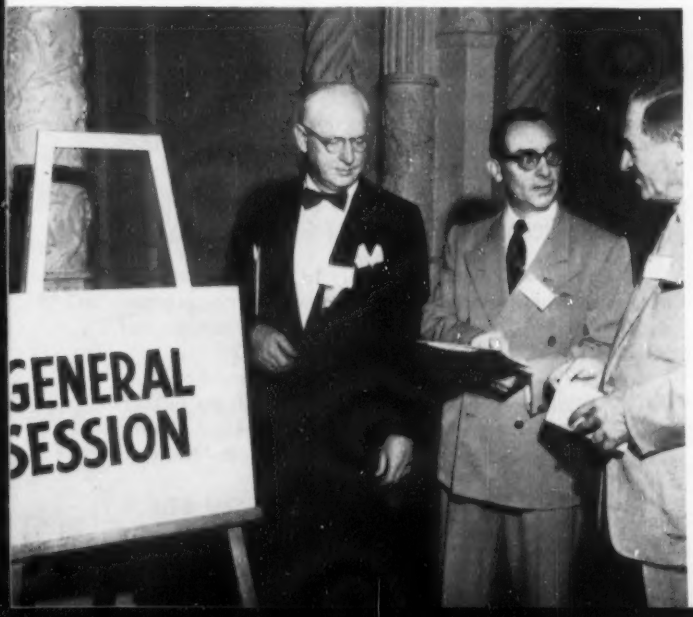
There were notable emphasis and timely concern over the competitive place of atomic, fossil fuel, and hydroelectric power generation. Generating station design, especially outdoor steam stations, came in for attention. But perhaps the most significant emphasis in both papers and sessions was brought to bear on problems of systems engineering and systems operation and on the place of extra high voltage transmission in the scheme of tomorrow's power supply system. All aspects from the design for overhead structures to the place of high voltage cable were examined thoroughly.

Estimate Nuclear Power Costs

Prospective competitive status of nuclear power and conventional generation should not be compared as if steam designs were frozen at present levels of costs and efficiencies. Rather, said W. R. Nutting, Pacific Gas & Electric, it should recognize further progress of fossil fuel plants. His long-range cost estimates showed up favorably for the nuclear plant but not for the immediate future because of conservative nuclear designs and large allowances for the natural contingencies of a developing art. His basis was $150 per kw and 30¢ per million Btu for a coal plant. Burn up of nuclear fuel was assumed at 10,000 megawatt-days per ton of uranium. Here he found a 12 mill generating cost. A 50-Mw nuclear plant would, he estimated, cost twice as much per kw as a 150-Mw unit.

Nuclear reactivity is analagous to the behavior of an electric generator as it is affected by its excitation and its internal reactance, P. N. Ross, of Westinghouse, said. Moreover a reactor has two significant coefficients. One is a power coefficient that is normally negative and related to the poisoning effects of the fission products. The other is a temperature coefficient that is desirably negative to facilitate control of activity and thermal output. The water cooled reactor, especially if enriched, has such a negative temperature coefficient.

Diffusion of neutrons in a reactor was represented by



Walter P. Morton, Pennsylvania Power & Light Company, with Joe Vivian and H. W. Tice, both of Southern California Edison Company

J. R. Stover, New York State Electric & Gas Corp; H. L. Harrington, Niagara Mohawk Power Corp; and L. W. Eighmy, Kerite Company

Arnold Rich, consulting engineer, Ft. Worth; R. W. Wilbraham, United Engineers & Constructors; R. F. Danner, Oklahoma Gas & Electric Co

Gabriel Kron, General Electric, in a series of equivalent electric circuits. The corresponding circuit equations greatly facilitate computation of reactor behavior on calculating boards.

Outdoor Plant Upkeep Problems

Outdoor plants were pioneered in the conducive climate of southern California at the Burbank and Glendale municipal plants more than 13 years ago. Their experience and that of Southern California Edison's more-recent Etiwanda plant constituted the heart of the discussion at the first power generation session.

Chairman V. F. Estcourt, Pacific Gas & Electric, cited a recent survey and commented that maintenance saving, as well as lower outdoor plant construction costs, appeared to be debatable. Maintenance may take longer, despite the greater accessibility afforded, because adverse weather may arrive after the overhaul has started. More frequent painting is necessary.

Initial savings of $3-4 per kw was estimated by A. E. Capon, Burbank, but these are prior to recent progress in adapting equipment to outdoor installation. However, an indoor turbogenerator costs 4-5% less than an outdoor unit. With outdoor units laggings deteriorate faster, instruments require more frequent attention, and shaft misalignment may result unless units are shielded during hot-weather overhaul.

H. C. Austin, Southern California Edison, said climatic conditions especially favor outdoor design except possibly for occasional wind and dust storms. But despite velocities upwards of 80 mph and blown topsoil, Etiwanda has operated throughout without reduction in output or significant damage to equipment.

Small Hydro Can Cost Less

Small hydro plants can be built with unorthodox simplicity, large hydro units can be tested and prolonged in life, and any size units can be operated at higher economic outputs without disadvantageous curtailment of life. These themes comprised the essence of one of the power generation sessions.

H. H. Gnuse, Nantahala Power, described design departures adopted in western North Carolina for a group of five hydros since 1948 that range from 1,800 to 12,000 kw, heads 117 to 929 ft, drainage areas 3.6 to 80.7 sq mi, costs per kw from $220 to $350. All are remotely controlled. Dams are rock filled and earth faced. Buildings are startlingly small as no control-rooms are necessary. Washout plugs pass the large flood flows, and float-controlled taintor gates discharge the normal excess flows.

Non-destructive testing is periodically applied by Southern California Edison to mechanical components of waterwheel generating units to detect flaws before they turn serious. Magnetic, dye penetration, and ultrasonic methods are employed separately or in combination, and T. C. Savert reported that the expense is well justified.

Economical limits of loading of waterwheel generators may be considerably higher than current North American practice. K. R. Knights, Hydro-Electric Power Commission of Ontario, and V. W. Ruskin, Canadian-Brazilian Services, showed this mathematically to the point where substantial gains in revenue dollars may be achieved if no other factors than winding temperature limit the output. Cost of more frequent winding replacement, because of higher sustained operating temperatures, would not necessarily cut too deeply into the added revenue desired from higher loadings.

Computers Determine Schedules

Application of digital computers to problems of economical operation of combined hydro and thermal generating systems was extensively discussed at both sessions devoted to power systems operation.

To achieve rapid calculation of water regulations for the West Group of the Northwest Power Pool, the task of programming the problem for automatic machine solution involved three determinations: best storage drawdown at

Kuhlman Distribution Transformers help supply electric power for modern living standards

Kuhlman Distribution Transformers, specifically engineered for dependable, low-cost service, help utilities provide a steady and reliable source of power to American homes. Under operating conditions of varying loads these units give exceptionally good voltage regulation. The bent iron core construction permits full utilization of the best qualities of transformer steel and requires very little reactive power from a distribution system.

Insulation of Kuhlman Transformers is coordinated with the basic impulse level. Wide oil ducts insure ample cooling. Construction throughout is sturdy and rigid. Careful finishing of the sealed copper bearing steel tanks insures long service under the most difficult weather conditions.

Kuhlman Distribution Transformers are built by highly experienced electrical technicians, many of whom have been on the job at Kuhlman for fifteen to twenty years. Kuhlman Distribution Transformers are produced in single and three phase ratings from 3 to 500 KVA. For complete information, write for Bulletins CS 201, CS 202, and CS 203. Kuhlman also manufactures Power, Dry Type, Saf-T-Kuhl, CSP, Subway and Series Street Lighting Transformers. Write for bulletins on these types as well.

152-M

KUHLMAN

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN • Southern Division, CRYSTAL SPRINGS, MISSISSIPPI

EXPORT REPRESENTATIVE: INTERNATIONAL STANDARD ELECTRIC CORP., 15TH FLOOR, 50 CHURCH STREET, N. Y. 7, N. Y. CABLE ADDRESS: MICROPHONE, N. Y.

SIXTY YEARS OF PROGRESS IN THE ELECTRICAL INDUSTRY

Harold Elliot, Porcelain Products, Inc, with C. M. Lytle, Kansas City Power & Light Co, and W. L. Carter, Pacific Telephone & Telegraph Co

D. P. Sayers, British Electric Authority; P. L. Bellaschi, consulting engineer, Portland, Ore.; Victor Siegfried, American Steel & Wire; and P. W. Shill, H. G. Acres & Co, Ltd, Niagara Falls, Ont.

Lee DeForest; Jesse E. Hobson, Stanford Research Institute; Eric T. B. Gross, Illinois Institute of Technology, at the Eta Kappa Nu luncheon

hydro reservoirs, amounts of steam generation from associated thermal plants, and amounts of interruptible load to be carried. C. W. Blake and Lyle Dunstan, Bonneville Power Administration, in a conference paper indicated that complexity of programming and machine time necessary for complete automatic machine solution appears uneconomical. However, they said a small digital computer programmed to perform the iterative procedure might be justified.

Use of a high speed digital computer to determine in a mathematical model the economical methods of operating a hydro-thermal system—such as BPA—was described by R. J. Cypser, International Business Machines. He treated minimization of operating cost as a problem in the calculus of variations.

J. J. Carey, University of Michigan, showed how to linearize a relation derived by Cypser for the load division among hydro and steam stations where the hydro stations are subject to water restraints.

Results of a joint investigation of economic dispatch on the Ohio Edison system making use of a digital computer was reported by R. H. Travers, Ohio Edison Co; D. C. Harker, Commonwealth Associates; and R. W. Long and E. L. Harder, Westinghouse. The method showed that it was feasible to determine a single economic dispatch pattern based on all units in service and to use this dispatch for conditions of units out of service, through-power-flow in the system, or economy interchange with adjacent systems. This obviates the need for a large number of dispatch curves for different conditions.

Application of an iterative method of pre-calculating generating schedules using a small scale digital computer of the type available in many utility accounting departments was described by A. F. Glimn, R. Habermann, and L. K. Kirchmeyer of General Electric Co with R. W. Thomas, Southwestern Public Service Co. The method allows a schedule to be obtained for a given value of incremental cost of received power, or a specific value of total generation, or for a specific value of total generation, or for a specific load on a given plant.

Transporting Fuel Is Cheaper

A comprehensive paper by C. F. Wagner, J. E. Barkle, and T. J. Bliss, Westinghouse, indicated that straight-away extra-high-voltage transmission appears to be superior to rail transportation of coal only for distances up to 100 or 200 miles. Stability is practically never a factor in loading lines in a power grid; also short time overload capabilities of short lines are almost unlimited. Apparent cost of transmitting 500 Mw for 400 miles at 80% load factor was estimated to be about equal to typical base generation costs.

A companion conference paper by D. K. Blake, R. M. Butler, and R. A. Schmidt, General Electric, emphasized the propriety of extra-high voltage for transmitting large power concentrations even relatively short distances. Sites and adequate cooling water are getting harder to find, and expanded transmission will be needed to reach these loads. The authors assumed that transient stability power load-

ing limits correspond to the most practical economic circuit loading for transmission distances of 50 miles or more.

Consolidated Edison of New York has a new automatic load frequency control system that was devised to meet several critical objectives. C. N. Metcalf presented the Baumann-Metcalf-Noest-Carolus paper with the following enumeration of objectives:

1. Stations participate in all load swings proportionately to their available capabilities.

2. Stations should continuously approach a preset economy loading schedule.

3. Regulating impulses must result only from system error.

4. Functioning should be adjustable to simplify the work of the system operator.

D. P. Sayers, British Electricity Authority, showed that high coal transport costs in England make a sound economic case for locating new generation near the midland coal fields with electrical transmission to the load areas if a high load factor can be maintained. Costs of transmission in U. S. and England were shown to be remarkably close, but costs of rail transport widely different. In the U. S. this results in transfer of energy as coal being cheaper than electrical transmission for long distances. In Britain, Sayers pointed out, the position is reversed.

A reduction of 40% in electric power transmission costs at 400 kv over 230 kv in Sweden was ascribed by B. G. Rathsman, Gunnar Jancke, and Sven Lalander, Swedish State Power Board, to use of series compensation, autotransformers, and lower insulation levels for lines and switchgear. An output of 1,000 Mw can be transmitted at 400 kv with three conductors per phase and 60% compensation. Corresponding output at 230 kv with two conductors per phase is 300 Mw, it was stated.

G. C. Conner and R. S. Seymour, BPA, reported that the most economical means of transmitting power from hydro plants east of the Cascades to the coastal areas is at 287-345 kv. These extra-high voltage lines will be integrated into the existing 230-kv Bonneville power grid.

Harvey D. Hunkins, Bureau of Reclamation, used the hypothetical problem of transmitting 4,200 Mw of power generated at the Utah coal fields 660 miles over six lines of 500 kv to Southern California to illustrate the need for constantly examining the delivered cost of coal and electrical energy in evaluating the relative economy of delivering energy by rail and by wire over long distances. He showed that with a loading of 700 Mw per line and transmission line load factor of 80% cost of electric transmission would be 1.86 mills per kwhr, for such a scheme.

Code Changes Would Cut Tower Weight

Changing the National Electric Safety Code to permit 35-deg swing angles and closer clearances to ground on high-voltage lines can cut tower weight for 288-kv line 5-10%, said P. L. Bellaschi, consulting engineer.

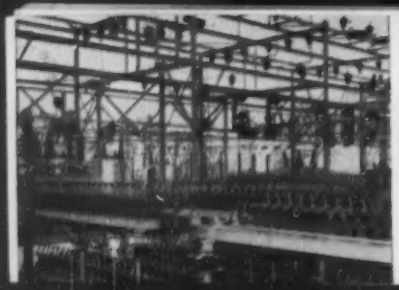
Transient stability need not be a serious limitation on conductor size for high-voltage transmission, according

(Continued on next page)

Frank Redding, Southern California Edison Co; John Nelson, Seattle City Light; T. M. Blakeslee, Los Angeles Dept of Water & Power

J. W. Erven, Los Angeles Dept of Water & Power; W. Scherring, Western Mass. Electric Co; C. C. Ernst, California Electric Power Co

R. H. Nau, University of Santa Clara, Calif.; N. L. Clarine, Southern California Edison Co; and E. V. Sayles, Consumers Power Company



L-M's New VDS Method

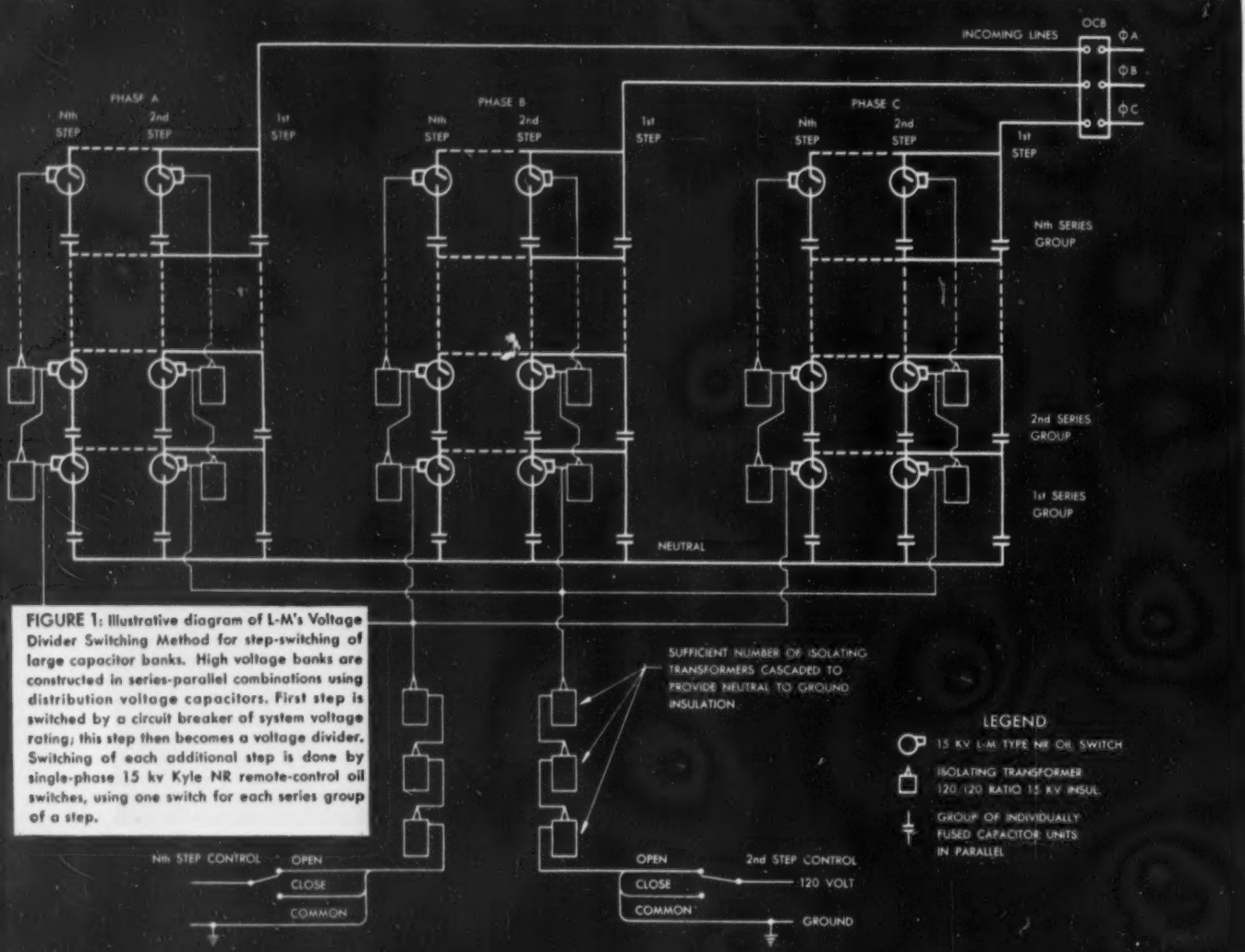
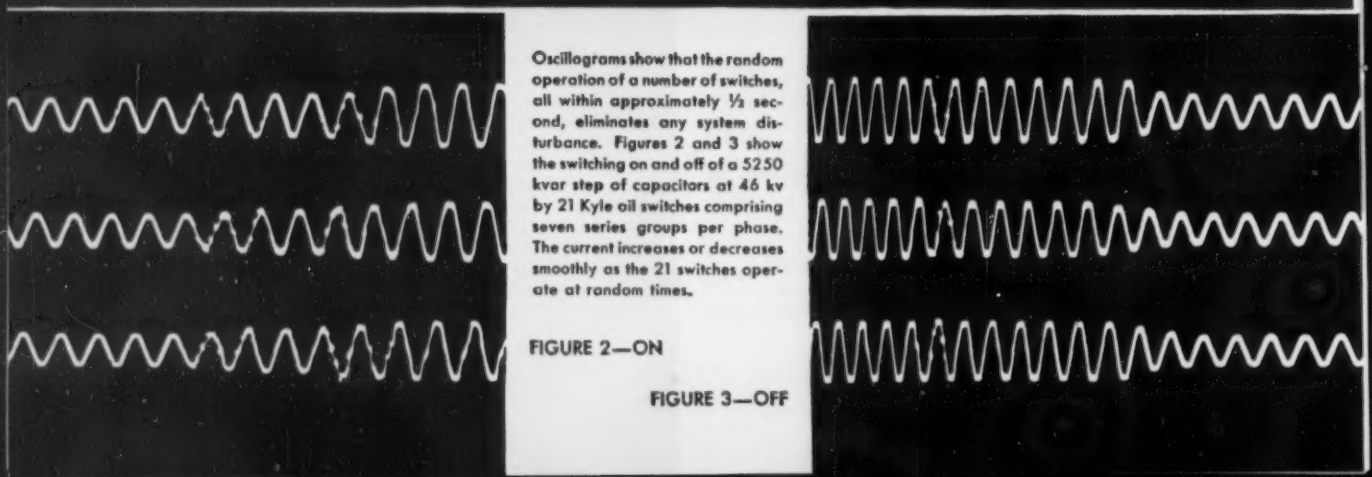


FIGURE 1: Illustrative diagram of L-M's Voltage Divider Switching Method for step-switching of large capacitor banks. High voltage banks are constructed in series-parallel combinations using distribution voltage capacitors. First step is switched by a circuit breaker of system voltage rating; this step then becomes a voltage divider. Switching of each additional step is done by single-phase 15 kv Kyle NR remote-control oil switches, using one switch for each series group of a step.



Oscillograms show that the random operation of a number of switches, all within approximately ½ second, eliminates any system disturbance. Figures 2 and 3 show the switching on and off of a 5250 kvar step of capacitors at 46 kv by 21 Kyle oil switches comprising seven series groups per phase. The current increases or decreases smoothly as the 21 switches operate at random times.

FIGURE 2—ON

FIGURE 3—OFF

Cuts Capacitor Switching Costs 40%

L-M develops low-cost method of switching large multi-step capacitor banks. Known as the Voltage Divider Switching Method (patent applied for), this method permits substituting low-cost 15 kv oil switches for circuit breakers on all but the first step of multi-step banks from 23 to 230 kv.

by **P. M. MINDER**
Application Engineer
Line Material Company

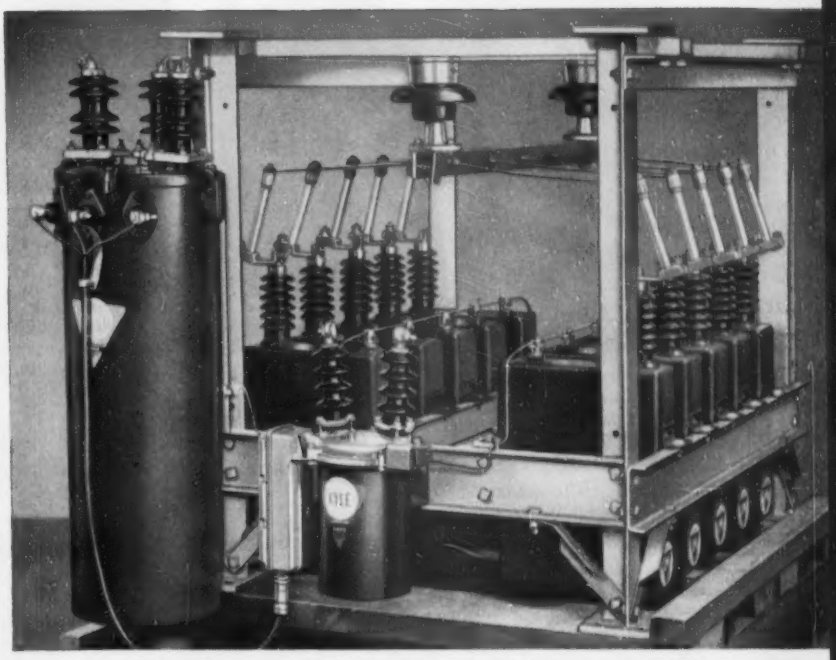
With the trend toward installation of capacitors on transmission and subtransmission circuits, capacitor switching has become a problem of economics. Large banks sometimes must be switched in a number of steps. The conventional practice requires a large breaker for each step. Thus the cost of switchgear for these large multi-step banks may become prohibitive.

L-M's Voltage Divider Switching Method utilizes L-M's Kyle NR remote-control 15 kv oil switches on all but the first step of a large bank. While a number of these switches are required, they cost only about $100 each, and even a number of them cost far less than a large breaker.

Cost Cut 40%, For Example

Here is an example of the comparative cost of switching by the conventional method and the VDS Method. Figures are based on a bank rated at 69 kv, 15,750 kvar, with 3 steps, each 5250 kvar.

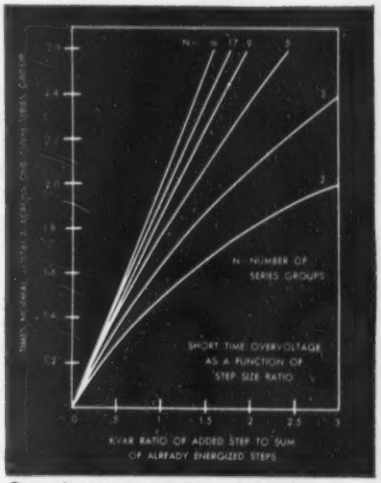
Figures include cost of switching equipment only. They do not include cost of automatic control equipment in either case. Nor do they include cost of installation, or the saving in foundations for two additional large breakers. It is evident that, in any case, the use of the VDS Method offers substantial savings. Discussion with one of the L-M Field Engineers will help you arrive at reasonably close figures for any individual application.



L-M's new factory-assembled stacking unit. The unit includes ten or more 25 kvar capacitors and the required fuses, Kyle NR switches, and isolating transformers mounted on the end of the frame. These stacking units are available in sizes from 250 to 600 kvar.

Figures Show What You Can Save With L-M's VDS Method

Conventional Method:	
1 OCB, 2500 MVA interrupting capacity; cost, about	$20,000
2 OCB's, 1000 MVA interrupting capacity; cost, about $13,500 each	27,000
Total, about	$47,000
Voltage Divider Switching Method:	
1 OCB, 2500 MVA interrupting capacity; cost, about	$20,000
2 switched steps using 30 Kyle NR switches (15 in each step) and equipped with all necessary isolating transformers and insulators; cost, about	8,400
Total, about	$28,400
Saving, VDS Method over conventional, about	**$18,600**


N = NUMBER OF SERIES GROUPS
SHORT TIME OVERVOLTAGE AS A FUNCTION OF STEP SIZE RATIO
KVAR RATIO OF ADDED STEP TO SUM OF ALREADY ENERGIZED STEPS

Overvoltages occur on the various series groups during switching. The highest overvoltage occurs when all but one switch of the second step are closed. These overvoltages are of brief duration and are kept at a safe magnitude by proper bank design.

Get Complete Information—Details of the new L-M Voltage Divider Switching Method (patent applied for) are available in a technical paper. Ask the L-M Field Engineer for a copy, and for information about L-M's Capacitor Application Engineering Service. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

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LINE MATERIAL *Elemex Capacitors*

Dr. J. E. Hobson, Stanford Research Institute, Calif; J. B. Hodtum, Allis-Chalmers Manufacturing Co; A. P. Hayward, Duquesne Light Co

Dr. W. A. Lewis, Illinois Institute of Technology; Don R. Russell, Idaho Power Company; Frank E. Bodine, Westinghouse Electric Corp

to a paper by R. M. Butler and D. L. Hopkins, General Electric. Conductors should be as large as possible for all transmission levels.

Use of wood in transmission structures was the subject of three conference papers, also presented at this session. H. V. Strandberg, Seattle City Light, cited experience with a 27-year-old, 165-kv, 100-mile, single-circuit wood-pole line. He predicted 35-year life for wood lines that have adequate treatment of butt, top, and bolt holes and use gain plates, shear rings, and metal spacers instead of wood blocks at insulator attachments.

Ralph G. Yerk, Hughes Brothers, described full-scale structure tests on 230 and 330-kv wood transmission structures. Tests are designed to reduce the length of cross arms and permit use of commercially available timber lengths of 32 ft and under. But Yerk observed that revision of the NESC to permit reduced clearances could lead to a return to standard X-braced, H-frame.

Ogden Sutro, Malleable Iron Fittings Co, discussed the application of round and dimensional wood members to transmission structures in which framing hardware is used to transfer stress between members. Until recently, he said, it has been impossible to develop strength of wood members because of the problem of making connections.

Andrew R. Jones, Westinghouse, offered test data verifying accuracy of the Witzke & Bliss integration method for translating surge strength performance of insulation—expressed in terms of the standard 1½ x 40 wave—to those of other surge shapes. The paper led J. H. Foote, Commonwealth Associates, to point out that such techniques encourage study of the effect of wave form on insulation performance and may bring about a better appreciation of the tolerance that exists in applying insulation to apparatus and systems.

A paper that specifically illustrated the significance of methods for evaluating performance of insulation under non-standard surge shapes was presented by J. K. Dillard, Westinghouse, W. R. Armstrong, Detroit Edison, and A. R. Hilemann, Westinghouse. In tests of the lightning surge protection of a 120-kv substation, they showed that a 1,520-kv surge from a 145,000-amp stroke six spans from the station would arrive as a 900-kv surge with a 2x12 microsecond shape at the station. Magnitude and shape of the incoming wave is a vital factor in locating protective devices in the station, it was pointed out.

New guides for the surge protection of transformers based on today's lower lightning arrester discharge voltages were laid down in a paper by J. K. Dillard and T. J. Bliss, Westinghouse, at the session on protective devices. The authors presented detailed suggestions for maximum distance between transformer and lightning arrester lead tap. As a rule of thumb, they suggested 1 ft per kv of circuit voltage for 100% arresters; 2 ft per kv for 80%.

Pipe-type Cables Get Attention

Discussion of oil-filled, pipe-type cables dominated the insulated conductor sessions.

A. N. Arman, Pirelli-General Cable Works, Ltd, England, said 305 v/mil is the maximum working stress for the 300-kv, oil-filled cable installed in the Kemano-Kittimat project in British Columbia.

Tests of a 301-kv, oil-filled cable, also designed for the Kemano project, were described by H. D. Short, Canada Wire & Cable Co, and J. T. Madill, Aluminum Co of Canada. This cable was designed for a maximum working stress of 287 v/mil.

Herman Halperin, Commonwealth Edison Co, Chicago, felt factory-test results on both cables were encouraging but did not offer sufficient proof that such voltages are commercially feasible at present. The thermal problem, as well as the need for constant low power factor, becomes more critical when cables are in ducts, he said.

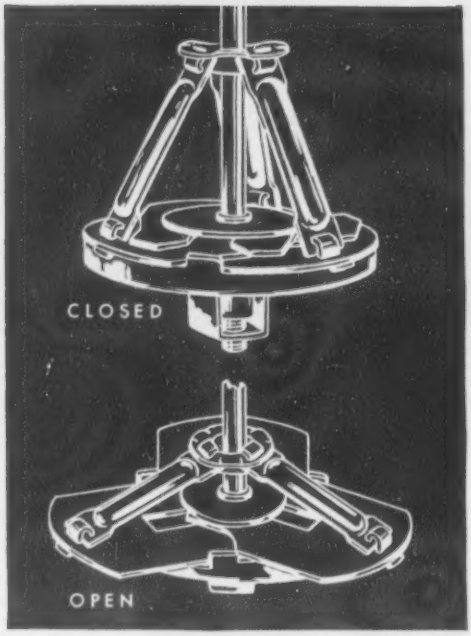
An exception was taken to Arman's conclusions by R. W. Atkinson, General Cable Co, who said American-made, 138-kv cables will withstand the impulse stresses imposed on the 300-kv cable. He doubted that the "particularly favorable" conditions of the Kemano project will provide a suitable test of the 300-kv cable accessories.

D. P. Sayers, British Electric Authority, reported the French favor compression-type cables operated at stresses

(*Continued on page* 36)

LINE CONSTRUCTION BLUEPRINTS

ITEMS SOME COMPANIES ARE USING TO MAKE LINE CONSTRUCTION WORK EASIER



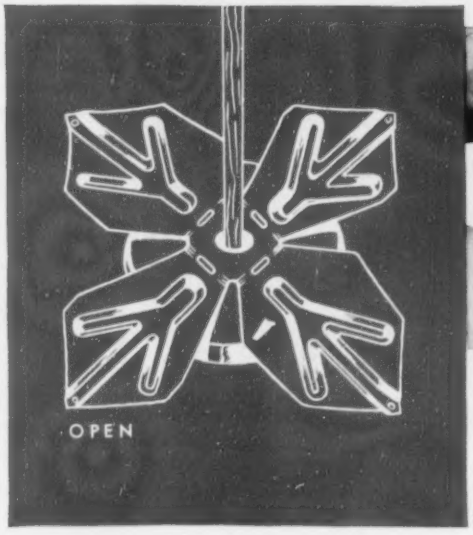
L-M SLIDING PLATE ANCHORS

now up to 20,000 pounds holding power

L-M sliding plate expanding anchors are heavily built, for smooth operation, easy installation, and tremendous strength. As the tamping block strikes the collar, the strong spreader arms give the steel blades a sliding action that cuts into undisturbed surrounding soil quickly and easily. Under tension the spreader arms act as trusses for the blades. These anchors are available in sizes listed below.

Available in 4 sizes

Catalog Number	Nominal Holding Power Pounds	Expanded Area Sq. In.	Type	Diameter Closed Inches	Approx. Net Wt. Lbs. per 100
200015E6	6,000	94	2-Way	8	850
200015E8	8,000	115	3-Way	8	1100
200015E10	10,000	135	4-Way	8	1350
200029B1	20,000	200	4-Way	10	2450



L-M 4-WAY PRESSED STEEL EXPANDING ANCHORS

HIGH strength, MINIMUM creep

Two-piece design . . . the four blades are formed of a single piece of sturdy steel. The center hole is extruded downwards, which provides a bearing surface against the rod to prevent binding, reinforces the tamping area, and provides an audible signal when the extrusion strikes the base, indicating full expansion.

Catalog Number	Nominal Holding Power Pounds	Expanded Area Sq. In.	Diameter—Closed Inches	Anchor Rod Diameter Inches	Minimum Mechanical Strengths Without Noticeable Deformation—Pounds
200026B1	6,000	110	8	⅛, ¼	16,000
200026B2	8,000	125	8	⅛, ¼	21,000
200026B3	10,000	132	8	1	24,000
200026B4	10,000	132	8	⅛, ¼	24,000

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Do You Have a Line Construction Problem?

These are just a few of thousands of L-M line construction specialties. If you have a line construction problem, let us know. We may have standard or special items in stock that will solve it. Ask the L-M Field Engineer, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LINE MATERIAL *Line Construction Materials*

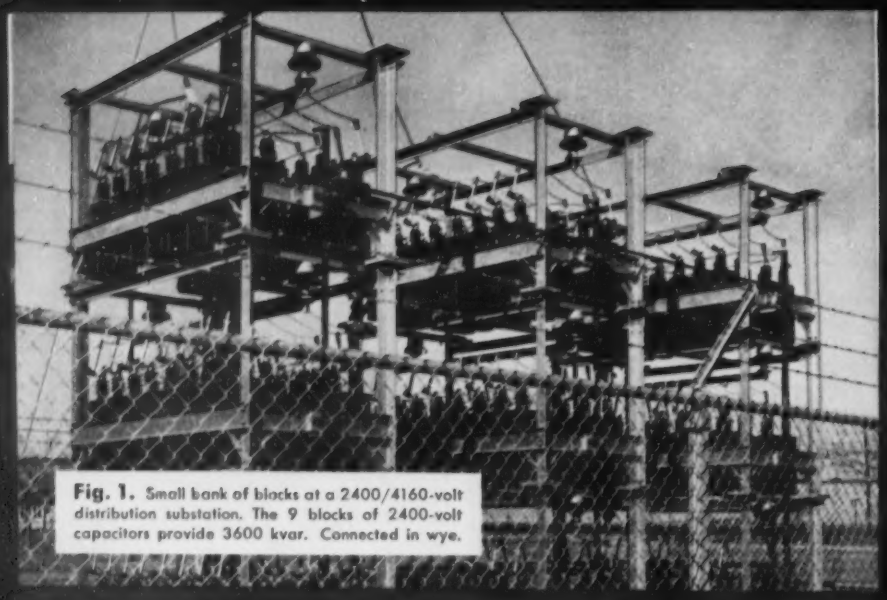


Fig. 1. Small bank of blocks at a 2400/4160-volt distribution substation. The 9 blocks of 2400-volt capacitors provide 3600 kvar. Connected in wye.

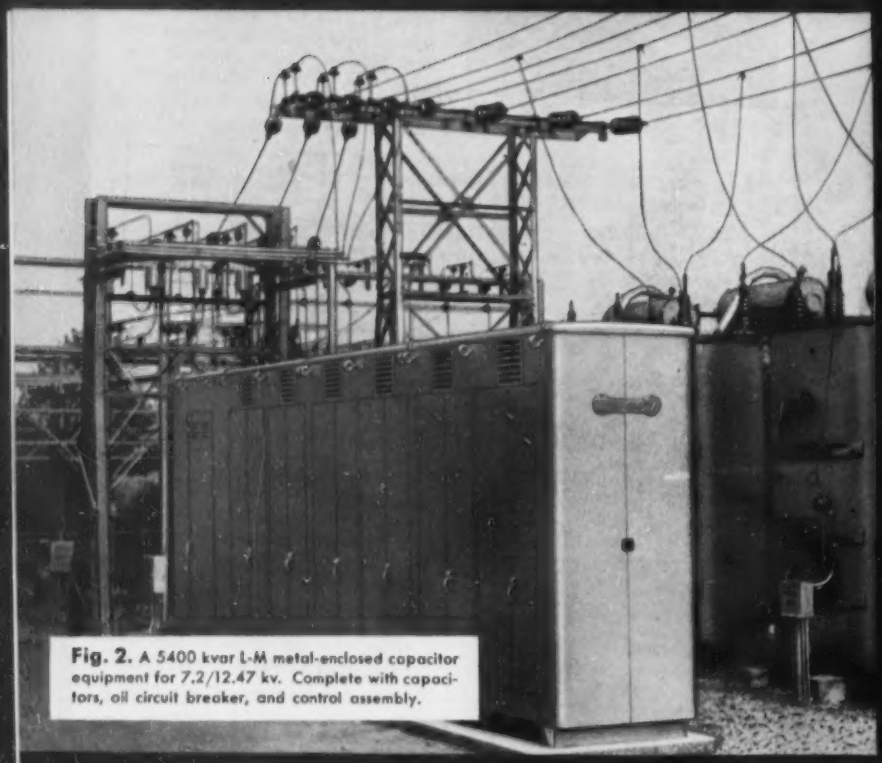


Fig. 2. A 5400 kvar L-M metal-enclosed capacitor equipment for 7.2/12.47 kv. Complete with capacitors, oil circuit breaker, and control assembly.

Fig. 3. A 300 kvar switched capacitor rack serving a suburban area. Note the simple, compact arrangement and accessibility of the entire assembly.

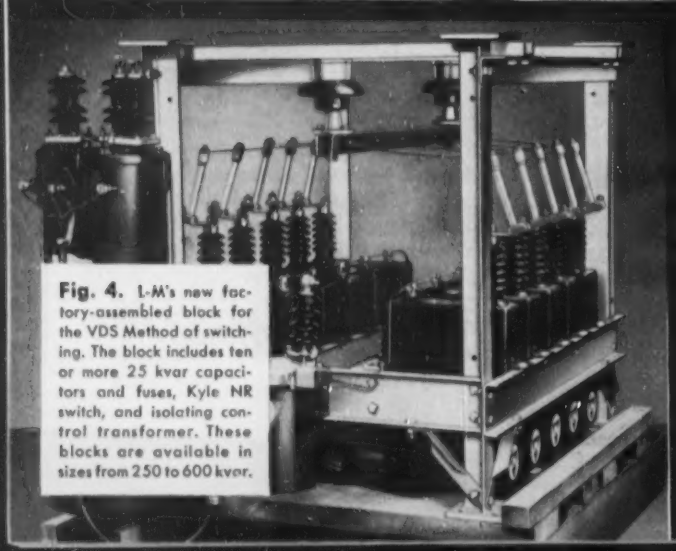
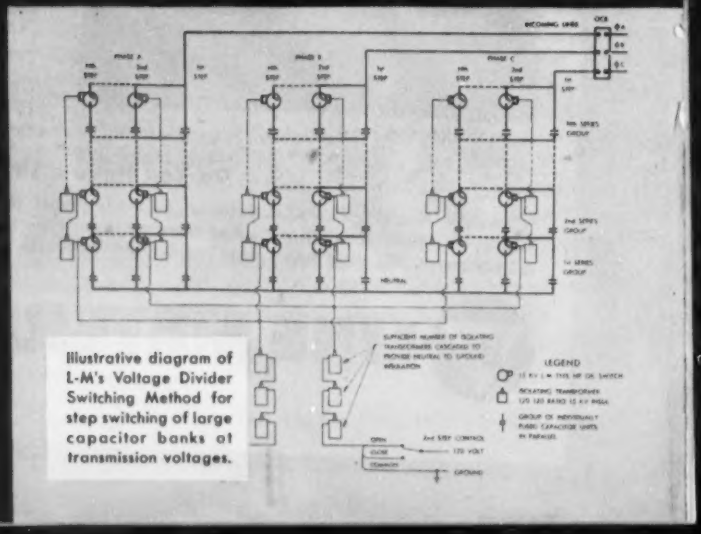


Fig. 4. L-M's new factory-assembled block for the VDS Method of switching. The block includes ten or more 25 kvar capacitors and fuses, Kyle NR switch, and isolating control transformer. These blocks are available in sizes from 250 to 600 kvar.



Illustrative diagram of L-M's Voltage Divider Switching Method for step switching of large capacitor banks at transmission voltages.

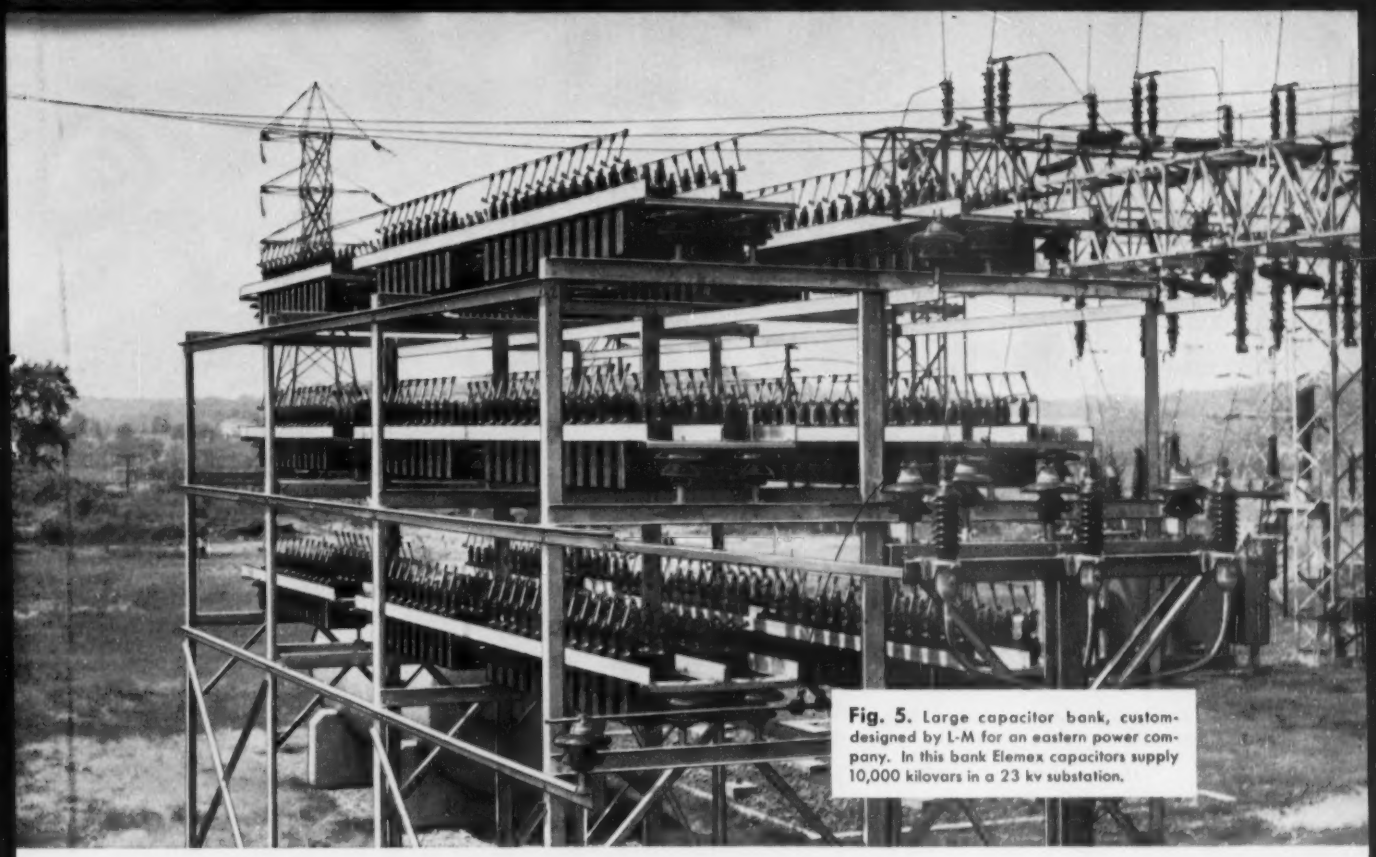


Fig. 5. Large capacitor bank, custom-designed by L-M for an eastern power company. In this bank Elemex capacitors supply 10,000 kilovars in a 23 kv substation.

L-M Offers Completely Engineered Capacitor Bank Installations

L-M's service includes a full line of equipment and experienced custom designing of any size of bank for transmission or distribution lines.

By **N. K. DELANEY**
Manager of Capacitor Sales
Line Material Company

The application of capacitors to distribution and transmission lines requires careful consideration of both electrical and economic factors. A large amount of information on equipment, protective schemes and cost must be available to the utility engineer for an intelligent decision.

Line Material Company is prepared not only to supply you with such information, but also to cooperate with utility engineers in working out the most satisfactory capacitor-application designs. This includes the best possible protective and step-switching schemes for any size and type of bank for operation at transmission or distribution voltages.

L-M's complete line of capacitor equipments includes pole-mounted racks factory-assembled blocks, metal-enclosed equipments, and custom-designed field-assembled banks.

Another and exclusive service to the industry is the L-M Voltage Divider Switching Method (patent applied for). This is an automatic switching scheme for large multi-step capacitor banks at transmission voltages. It involves substituting a number of low-cost 15 kv oil switches for the large circuit breakers on all but the first step on multi-step banks up to 230 kv. The VDS Method saves about 40% of the cost of breakers alone. A special block assembly has been designed to simplify installation of the VDS Method.

Ask Us For Complete Information

We would appreciate an opportunity to tell you about our products, and about our Capacitor Bank Engineering Service. Ask the L-M Field Engineer to discuss it with you; or write Capacitor Sales, Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

L-M Capacitor Equipments

Factory-assembled blocks in complete range of NEMA-standard sizes and ratings. Blocks save time and money in assembling large banks. (Fig. 1)

Metal-enclosed capacitor equipments in all NEMA-standard distribution voltage sizes and ratings. (Fig. 2)

Factory-assembled racks for pole-mounted banks. Sizes with 15 kv spacing up to 300 kvar switched and 375 kvar unswitched assemblies with 25 kvar units. (Fig. 3)

VDS Method factory-assembled block for large multi-step capacitor banks, an L-M-exclusive method that reduces costs of switching equipment. (Fig. 4)

Custom-designed field-assembled banks with recommendations for the protective and switching schemes. (Fig. 5)

LINE MATERIAL

Elemex® Capacitors

M. A. Bostwick, Portland General Electric Co, Ore.; A. R. Waehnor, Line Material Company; and E. B. Kipp, San Diego Gas & Electric Co

Edward Sixtus, Federal Electric Products Co; Whitman Ridgway, General Electric Co; and R. L. Brinton, Pacific Gas & Electric Co

up to 330 v/mil while the British favor impregnated paper, high-pressure gas cables. Test lengths of cable corresponding in voltage to the Kemano installation will be full-load tested for five years, he said.

Revision of values of power factor to less than 0.5% in AEIC specifications covering 230-kv cables and lower was advocated by P. L. Bellaschi. For voltages above 230 kv even lower values of power factor should be used. He also suggested a test code covering impulse testing of cables that would spell out the type of test to be used. He felt routine testing of cables by manufacturers is not in keeping with their ability to build higher-voltage cables.

Conclusions based on recent studies of pipe-type cables were offered by G. N. Everest and P. V. White, Okonite Co: Load capability of cables in excess of 230 kv is limited by dielectric loss. High-pressure oil cables are stable at high temperatures for maximum stresses exceeding 300 v/mil. Loads of 300 Mva for buried installations and up to 500 Mva "in air" on a single-pipe, 380-kv system are feasible under certain conditions.

Pipe Cable Practices Uniform

Examining the seldom-explored area of the pipe, which is sheath, pressure vessel, and structure of a pipe-type cable in one, R. W. Gillette and J. E. Johnson reported practices of some 18 users. Notable was a 15 to 3 preference for flared pipe joints over bell and spigot type which restricts cable pulls to one direction but eliminates need for a backing ring. All but 2 of 15 user-companies test all welds, 9 using a pressure usually 500 psi and 4 a drop test. Gillette said Con Edison's practice is also to x-ray each weld. R. J. Mather, BPA, urged cathodic protection of pipe over asphalt coatings on a cost basis. He compared coating cost of $1,100 per mile with cathodic protection costing $37 per mile plus $4 per mile per year operating cost.

Full scale fault tests of pipe-type cable by Bonneville Power Administration were reported by R. J. Mather and J. A. Purviance, BPA. Arc-generated pressures were found too small to threaten rupture of either ¼ or ½-in. pipe but arc fusion could puncture a ¼-in. pipe wall but not a ½-in. Faults within one phase of a pipe-type cable will not likely cause serious damage to adjacent phase conductors, authors said.

Feasibility of replacing 1,500 MCM copper with 2,250 MCM aluminum conductor in 138-kv high-pressure, gas-filled, pipe-type cable was established in studies by Joseph Sticher and R. H. Hiester, Detroit Edison, with Louis Meyerhoff and M. H. McGrath, General Cable.

A new aluminum-bodied compression-type wye splice for use with insulated aluminum cable having either an aluminum or copper tap was described by Fred Heller, Burndy.

Reducing Rural System Overvoltage

The session on distribution covered overvoltage on rural systems, economic conductor size, and computation of conductor capacitances and reactances.

Two papers, one by L. B. Cramm and R. B. Flickinger, REA, and another by G. G. Auer, General Electric, were closely related. The former dealt with experience with long, lightly-loaded 14.4/24.9-kv rural lines; the latter with analysis of the overvoltage phenomena on a transient network analyzer. Overvoltages of two to four times normal were experienced and found by test on the open phase or phases of the multi-grounded system when one or two phases were de-energized. Arresters, reclosers, and meters occasionally were damaged. Studies indicated that grounded wye-wye appears to mitigate the overvoltage if the line section is less than five miles. A resistor in the neutral of a wye-delta bank will suppress sustained overvoltages. The best solution appears to be careful sectionalizing to take advantage of existing loadings.

Selection of economic conductor, fully recognizing effects of growth and time, usually results in a larger size than is normally adopted, said H. H. Hunt, Sacramento Municipal Utility District. He showed that instead of 120 MCM for 32 to 250 amp, the size should be three times as large. A saving of $1,930 per conductor mile would result. Significantly, loading on the economical conductor never reaches the thermal limit.

We've decided to use the **NEW**
S&C OPEN CUTOUT
and save all this bother

Don't waste time on a detailed short circuit analysis—deciding just where heavy duty cutouts are needed. The NEW S&C Type XS can be used wherever you need an open cutout.

S&C OPEN CUTOUTS CAN BE USED FOR BOTH "HEAVY DUTY" AND "STANDARD DUTY" APPLICATIONS

Type XS, single-shot style, birdproof insulator. Also available in three-shot style, and with NEMA insulators.

. . . they give heavy duty protection, but meet standard duty cutout budgets

The increased interrupting capacity of the S&C Type XS eliminates the problem of deciding where heavy duty cutouts will be needed . . . an S&C Type XS can be used in every case . . . for it has an interrupting capacity of 5,000 amperes (7.5 kv rating), and 4,000 amperes (15 kv rating).

It is no longer necessary to carry warehouse and service truck stocks of both standard and heavy duty cutouts. Nor do you have to worry about construction crews installing the wrong cutout at a particular protection point.

All these advantages become economically justifiable because, for the Type XS Cutout, S&C has developed a recoil mechanism that makes it unnecessary to resort to conventional means of increasing cutout interrupting capacity—namely, heavier construction, large bores, and double venting—which not only increase cutout costs but usually sacrifice performance, especially on low fault currents.

Information about the Type XS Cutout is contained in the new S&C Catalog Section 511 . . . we will gladly send one at your request.

S&C ELECTRIC COMPANY

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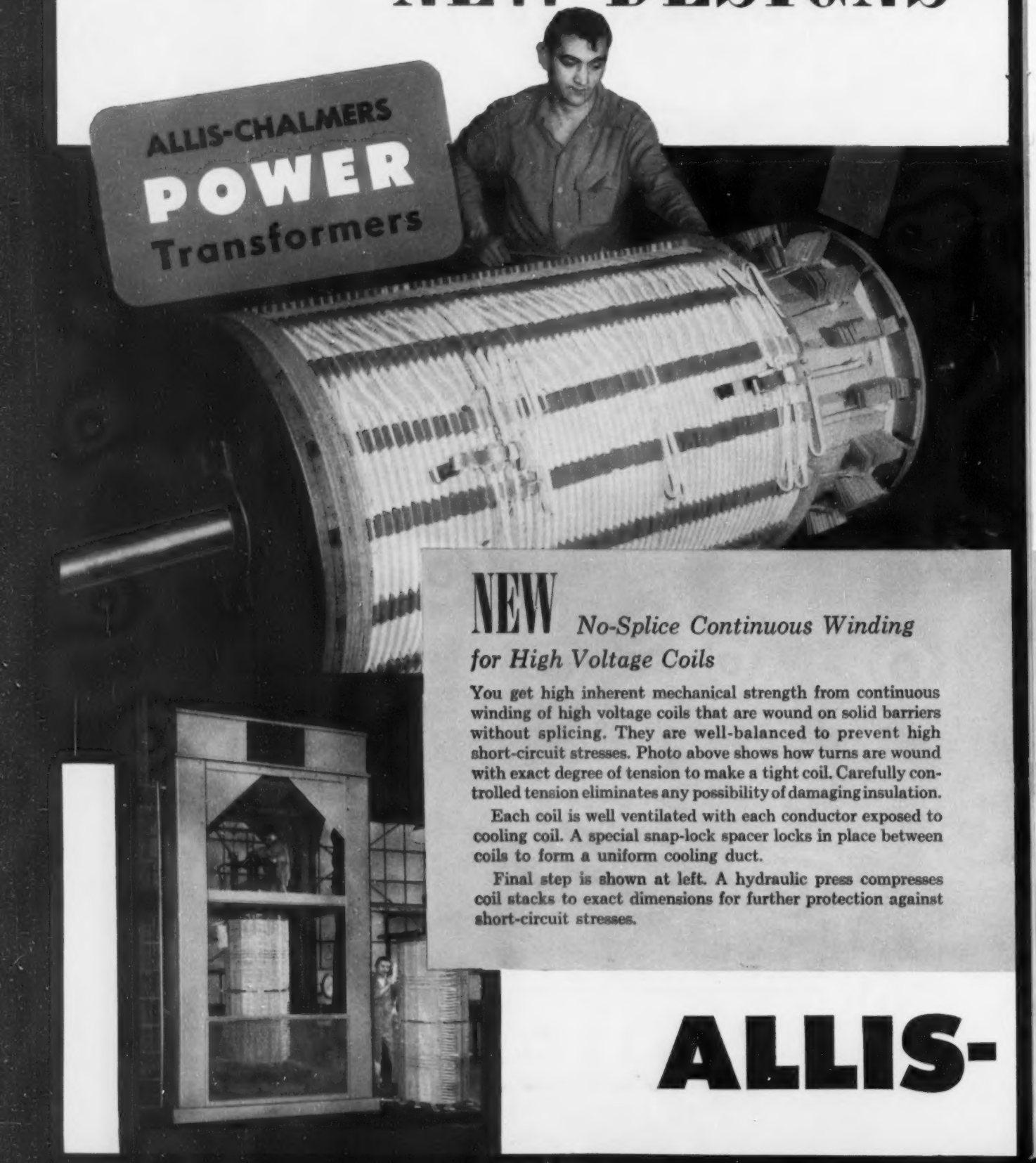
Specialists in High-Voltage Circuit Interruption

How NEW DESIGNS



NEW *No-Splice Continuous Winding for High Voltage Coils*

You get high inherent mechanical strength from continuous winding of high voltage coils that are wound on solid barriers without splicing. They are well-balanced to prevent high short-circuit stresses. Photo above shows how turns are wound with exact degree of tension to make a tight coil. Carefully controlled tension eliminates any possibility of damaging insulation.

Each coil is well ventilated with each conductor exposed to cooling coil. A special snap-lock spacer locks in place between coils to form a uniform cooling duct.

Final step is shown at left. A hydraulic press compresses coil stacks to exact dimensions for further protection against short-circuit stresses.

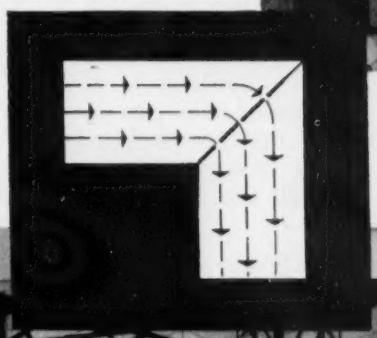
ALLIS-

Improve Power Transformers

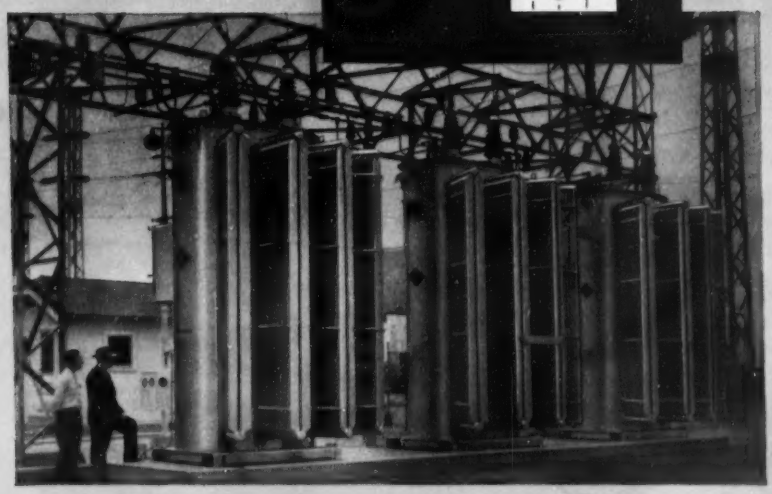
New continuous windings on solid barriers eliminate all splices and assure high mechanical strength of coils on Allis-Chalmers small power transformers . . . snap-lock spacers provide uniform cooling ducts. New mitered core design gets full advantage from modern core steels, reduces exciting current. Here's the full story:

NEW *Mitered Core Design Uses Cold-Rolled Steel*

Transformer exciting current is reduced 50% when mitered core design permits use of best properties of cold-rolled steel. Steel is cut and stacked to take advantage of orientation so that flux flows easily. Mitered core also permits reduction in weights and dimensions.



MITERED DESIGN MINIMIZES AIR GAP between joints, keeps exciting current low. Steel is cut and stacked to take advantage of orientation properties of core steel.



Next time...

you consider power transformers for your system, it will pay to investigate the advanced design and expert workmanship Allis-Chalmers provides. Call a transformer expert from the nearest A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin for more information.

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A-C ALLIS-CHALMERS

Compare these Ground Rod Driving Costs...

ONE MAN

with a KEARNEY GROUND ROD DRIVER drives two rods faster than...

TWO MEN

can drive one rod with one pounding and the other holding.

YOU CAN SAVE up to 75% in installation costs when your crews work with the help of a KEARNEY GROUND ROD DRIVER. Actual field tests have shown that one man can drive two rods the KEARNEY way in less time than it takes two men to drive one rod with a sledge.

SEE how fast and simple it is to operate

1. Any length of rod is inserted through the hollow rod driver handle.
2. A heavy chuck grips the rod near the ground. It is moved up as the rod is driven.
3. Weight does most of the work as the worker drives the handle down onto the chuck. Worker remains in a safe, up-right position at all times.

SALVAGE old rods and save money. Simply reverse the above procedure to pull rod that is already in the ground.

Write today for Prices.

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For Better Construction SAFER Maintenance!

KARL F. BADER D. ROBERT DAVIES HAROLD G. MEENEN

Illinois Power Elects 3 VPs

Illinois Power Co has elected three new vice presidents. They are Karl F. Bader, secretary of the company, and D. Robert Davies and Harold G. Meenen, formerly assistants to the president.

Filled Treasury Post . . . Employed by Illinois Power and its affiliates since 1920, Bader became assistant treasurer twelve years later. He was elected secretary and a member of the company's board of directors in 1946. He will continue to hold the position of secretary and will have charge of general corporate affairs, including budgets, taxes, insurances, claims, real estate, and other corporate functions for the company.

Davies joined the Illinois utility in 1942, having been employed prior to that time by North American Co, a New York public utility holding firm. He was made transfer agent for the company's stock in 1942, assistant secretary in 1946 and assistant to the president in 1952. In his new capacity as vice president, he will be responsible for co-ordination of the utility's operations and will handle bond and stock financing activities.

To Handle Commercial Activities . . . Meenen left a St. Louis public accounting firm to join Illinois Power in 1950. A year later he was named assistant comptroller and assistant to the president in 1952. As vice president, he will be responsible for various commercial functions, including rates, sales, advertising, commercial office operation, and customer relations.

Arkansas P&L Appoints New Division Manager

Paul Griffith, industrial sales manager for Arkansas Power & Light Co, has been named manager of the company's Little Rock Division. He will assume his new duties on Aug. 1, replacing Division Manager R. Bly Wagner, who is retiring after more than 30 years of service.

Griffith's service with the company dates back to 1921, when he was employed in the meter department of Little Rock Railway & Electric Co, a predecessor company. He soon was transferred into the commercial department as a power sales representative responsible for the sale of power to industrial customers of Arkansas P&L.

As AP&L's industrial manager since 1942, Griffith negotiated many of the big wartime and postwar industrial power contracts that were instrumental in the company's load growth during the past few years.

Wagner's service with the company dates back to 1923. He first served as assistant manager of the Pine Bluff Co, predecessor of AP&L.

Succeeding Griffith as industrial manager will be Howard P. Lindsay, industrial sales engineer at Pine Bluff, a 20-year veteran with AP&L. He has served as a rural specialist, assistant engineer, industrial salesman, and industrial sales engineer.

New ASME Head . . .

. . . will be David W. R. Morgan, vice president of headquarters staff of Westinghouse Electric

David W. R. Morgan, vice president on the headquarters staff of Westinghouse Electric Corp, has been nominated as next president of the American Society of Mechanical Engineers.

He is the second Westinghouse engineer to be so honored. A. C. Monteith, vice president of engineering, was installed recently as president of the American Institute of Electrical Engineers.

With Westinghouse Since 1913 . . . Morgan has been with Westinghouse since 1913 in various assignments connected with power generating equipment. For 25 years, until 1940, he was engineering director of the largest steam condenser manufacturing activity in U. S. He holds more than 30 patents.

Other nominations include the following:

Vice presidents: James B. Jones, head of the mechanical engineering department, Virginia Polytechnic Institute; Ben G. Elliott, chairman, department of mechanical engineering, University of Wisconsin; and C. H. Shumaker, chairman, department of industrial engineering, Southern Methodist University.

Directors-at-large: George A. Hawkins, professor of thermodynamics, Purdue University; Harold C. R. Carlson, president, Carlson Co; and Louis F. Polk, president, Sheffield Corp.

•

Dr Charles M. Slack has been granted a year's leave of absence as director of research and engineering for Westinghouse Electric Corp's Lamp Division, Bloomfield, N. J. During his absence, **Dr R. M. Zabel,** manager of engineering, will assume overall engineering responsibilities of the division.

Harvey P. McPhail, who supervised electrical designs for Hoover, Grand Coulee, Norris, Wheeler, Madden and Shasta dams, will retire July 31 as assistant commissioner of the Bureau of Reclamation. He will become a

How to duck a HOUSING PROBLEM

Elliott outdoor-splashproof (weather-protected) motors have projected a new economy into the industrial picture.

A big motor must breathe. It needs a constant stream of cooling air, clean and dry, through its coils and windings. For outdoor service you can, of course, use a standard open motor and build housing over it. Or you can install a totally-enclosed motor. Both means are unnecessarily expensive. The happy, economical alternative is this Elliott outdoor motor, which breathes outdoor air, but rejects moisture, sleet, snow, dust, dead leaves, even insects and small animal life. An ingenious arrangement of sheet steel baffling, screens and filters does the trick.

Elliott outdoor motors are a typical product of the sound engineering and development work which in half a century has made the Elliott Company one of America's important builders of a broad line of equipment for power and process use. For complete details on any of this equipment, contact your local Elliott field engineer, or write the Elliott Company, Jeannette, Pa.

ELLIOTT Company

94-8

TURBINE-GENERATORS TURBINES MOTORS GENERATORS DEAERATING HEATERS EJECTORS CONDENSERS COMPRESSORS TURBOCHARGERS TUBE CLEANERS STRAINERS

power consultant for Kuljian Corp, Philadelphia, consulting engineers. McPhail has been in charge of power and irrigation since his appointment in February, 1952, as assistant commissioner. In 1953 the Department of Interior awarded him a citation for distinguished service in formulating the agency's power program. He went to work for the bureau in 1919.

Pioneer Service Makes Engineering Changes

D. C. Hormell, chief mechanical engineer of the Pioneer Service & Engineering Co, has been promoted to chief engineer replacing Noah C. Pearcy who has accepted a position as general manager, engineering, with the management company for the Brazilian Traction, Light & Power Co, Ltd. Carl B. Barthelemy, mechanical engineer, will replace Hormell.

Hormell has been associated with the company's mechanical design section for the past 24 years, prior to which he had extensive experience supervising design, construction, and operation of utilities in the U. S.

Barthelemy joined the company's engineering section as mechanical engineer in 1948. Previously he had been with Northern States Power Co.

Director of Purchases

Robert B. Gear has been appointed director of purchases for Commonwealth Edison Co, Chicago. Gear, who has been with the Commonwealth system for more than 25 years, succeeds Charles D. Auringer, who has resigned. In his new capacity, Gear will be in charge of buying and store functions for all electric and mechanical equipment and materials and supplies.

Heads American Bridge

Norman B. Obbard has been appointed president of United States Steel Corp's American Bridge Division to succeed Frank K. McDanel, who is retiring. Obbard joined American Bridge in 1926 as an engineer in the tower department. He has been vice president general contracting manager since 1946.

H. A. STROUD

Stroud Named Chairman of Better Light Bureau

H. A. Stroud, promotion manager of Monongahela Power Co, Fairmont, W. Va., has been elected chairman of the Better Light Better Sight Bureau. He succeeds S. L. Drumm, vice president in charge of sales for New Orleans Public Service, Inc, who has been chairman of the bureau since 1952.

Active in bureau affairs, Stroud served on the bureau Home Lighting Education Committee for over ten years, and was chairman of that committee during 1946-48 and 1951-54. He has also played a leading role in the development of several widely used bureau programs for teaching about light and sight in school classes.

Stroud, a graduate of Penn State University, has been employed by Monongahela Power and associated companies for 29 years.

•

Phil Aspinwall has been transferred by Puget Sound Power & Light Co from Olympia, Wash., to Enumclaw as local manager there and also of nearby Buckley. Aspinwall, who was farm consultant at Olympia, replaces Le Pettett, now associate engineer for the same area. In another change, Robert Bennett, formerly industrial service consultant in the Valley communities south of Seattle, was appointed assistant local manager at Puyallup.

Shermer L. Sibley has been appointed assistant to the vice president and general manager of Pacific Gas & Electric Co. Graduated from the University of California in 1936 with a degree in electrical engineering, Sibley was employed by PG&E as a mapper and estimator. In 1946 he was made an office assistant in the department of the vice president and general manager and in 1950 was promoted to office engineer.

Ernest E. George, manager of design and application engineering of the Carboloy Department of General Electric Co, Detroit, has been appointed manager of magnetic products engineering. He joined GE in 1933.

Arthur C. Treece has been named manager of marketing for General Electric Co's laminated and insulating products department with headquarters at Coshocton, Ohio. With GE since 1922, he formerly was manager of employee and plant community relations for the Chemical Division.

Hatfield Chilson, past president of the Colorado Bar Association, has been appointed to the policy-making position of attorney for the Colorado Water Conservation Board, succeeding Jean S. Breitenstein, newly appointed U. S. district judge. Chilson is a director of the Northern Colorado Water Conservancy District.

OBITUARY

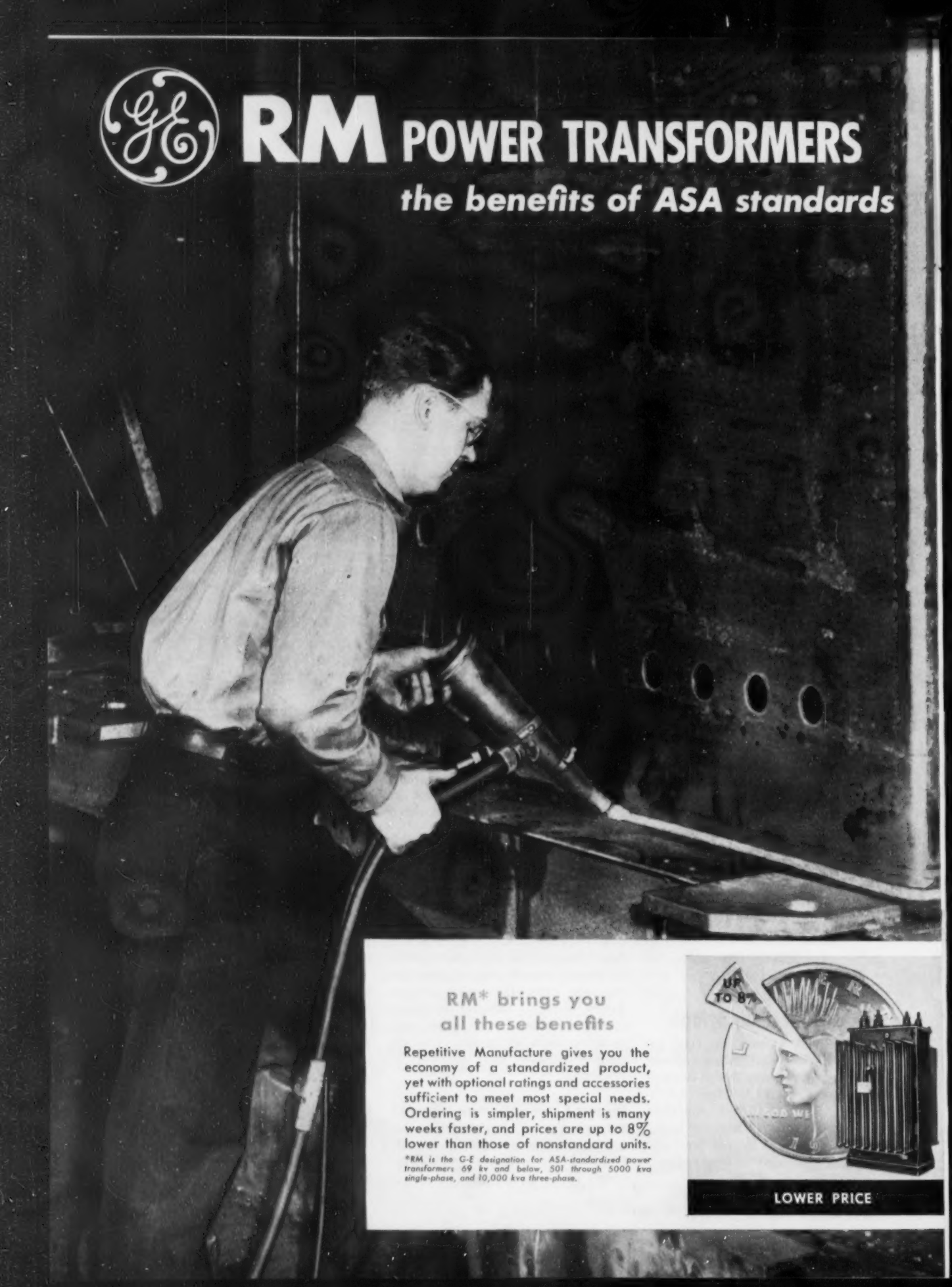
Herman Weisberg, 54, mechanical engineer, electrical engineering department of Public Service Electric & Gas Co, Newark, N. J., died June 29 at Baltimore. He began with Public Service as planning and installation engineer in the electric generation department. Later, he was promoted to assistant mechanical engineer, becoming mechanical engineer of the department in 1941. He was a member of EEI's Prime Movers Committee.

Milan R. Cook, former manager of residential sales for the Hartford Electric Light Co and later assistant to the general manager, died recently in Hartford, Conn. He had joined the company in 1928.

Frank Julian Stone, 92, for 31 years New England manager of the Electric Storage Co at Boston, until his retirement in 1926, died at Brookline, Mass., on July 5.

RM POWER TRANSFORMERS

the benefits of ASA standards



RM* brings you all these benefits

Repetitive Manufacture gives you the economy of a standardized product, yet with optional ratings and accessories sufficient to meet most special needs. Ordering is simpler, shipment is many weeks faster, and prices are up to 8% lower than those of nonstandard units.

**RM is the G-E designation for ASA-standardized power transformers 69 kv and below, 501 through 5000 kva single-phase, and 10,000 kva three-phase.*

LOWER PRICE

plus . . . . . .

Stronger liquid-tight tanks

because submerged arc welding strengthens major tank joints

When you need a transformer in the medium range, order a Repetitive Manufacture transformer, and you'll get all the benefits of ASA standards plus many extra advantages that give you better performance, easier handling and less maintenance.

STRONG, LIQUID-TIGHT TANKS, for example, virtually end damage and leaks from shipment and handling. Tanks are stronger because submerged-arc welding, pictured at left, strengthens all major tank joints. In this new process now in use at General Electric's new Medium Transformer Plant, an electrode wire is fed into an arch which is submerged in the granulated flux material deposited ahead of the arc by the welding head. Uniform welding speed is maintained by a driver geared to this head.

Developed by General Electric, this continuous welding process assures stronger, less brittle, more dependable welds of deeper penetration at major tank joints. Damage which can result from shipping and rough handling is minimized and tanks remain liquid tight.

MANY OTHER BENEFITS result from the advanced methods and processes used in General Electric's new plant at Rome, Ga. These include high dielectric strength because vapor-phase drying removes entrapped moisture; superior rust prevention because new Super Melaglyp paint finish lasts up to 150% longer; quicker delivery from faster, conveyorized production. Built solely to produce power transformers in the medium transformer range, this plant serves electric utilities and industry by turning out better products in a shorter time. You can get full information about RM power transformers by contacting your nearest G-E Apparatus Sales Office, or writing for Bulletin GEA-6108 to General Electric Company, Section 422-10, Schenectady 5, New York.

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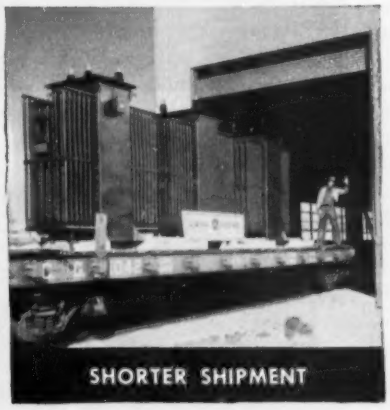
SIMPLIFIED PURCHASING



SHORTER SHIPMENT

G.E.'s NEW ROME, GA., TRANSFORMER PLANT—built specifically to meet the growing trend to standardize power transformers.

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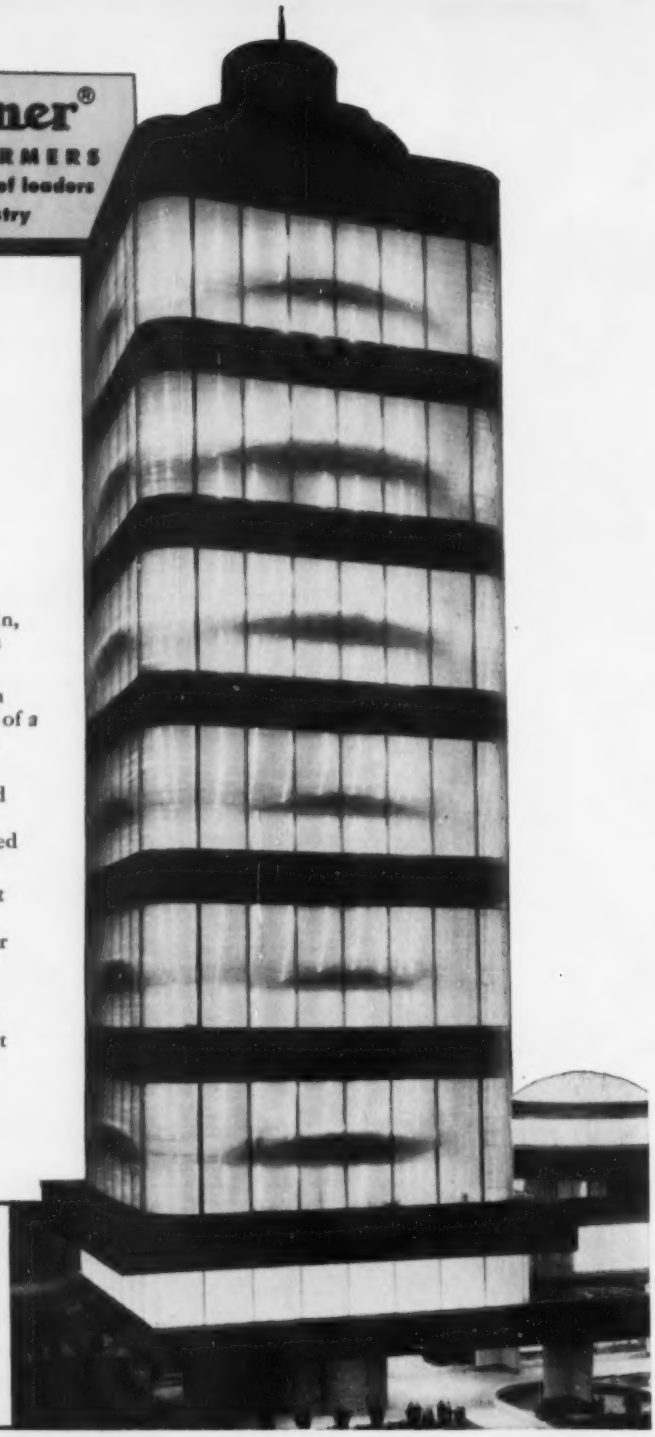
TRANSFORMERS
...the choice of leaders in industry



electricity helps plan for tomorrow

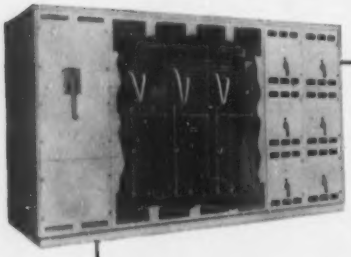
Research peers into tomorrow from this dramatic 156-foot "Helio-lab"—the Research and Development Tower of S. C. Johnson & Son, Inc., Racine, Wisconsin, world-famous manufacturer of wax products for the home, industry, and agriculture.

The Helio-lab is a versatile tool for research because it responds electrically—at the flick of a switch—to all demands for uncontaminated air, heat, light, lift, movement and control.

Power for the air conditioning, lighting and motor loads is supplied by a 750 kva and a 300 kva I-T-E Unit Substation, each equipped with Wagner Dry-Type Transformers.

Wagner Transformers are an important part of the equipment of many great industrial plants. In every case they are adding to their reputation for complete dependability . . . for unfailing service.

Let a skilled Wagner engineer discuss your transformer needs with you. Call the nearest of our 32 branch offices, or write us direct.



Metal-clad substation, equipped with a 750 kva Wagner dry-type transformer, at the Johnson "Helio-lab."

Wagner Electric Corporation EST. 1891

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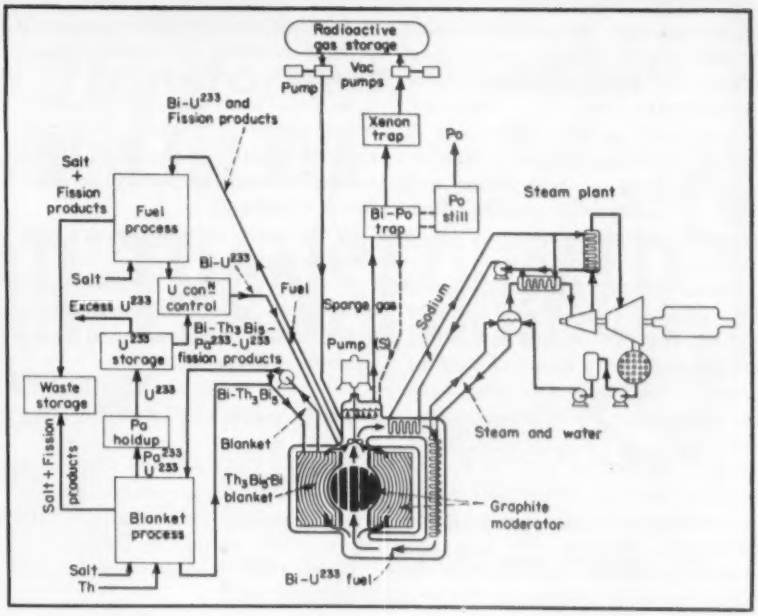
ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

WT54-3

Ann Arbor meeting hears Brookhaven scientists propose reactor using nuclear fuel in liquid metal. Experiments indicate that . . .



EXTERNALLY COOLED REACTOR continuously circulates the liquid uranium-thorium fuel to external heat exchangers where the fuel transfers its heat to the secondary coolant (sodium)

LMF Reactor Offers Cheap Power

Steam at about 1,000 F is predicted from a new reactor system using liquid metal fuel. The so-called LMFR thus approaches the steam conditions of many modern thermal plants and makes fission heat more competitive with conventional fuels. It promises not only low capital costs but low operating costs as well.

The LMFR system was proposed for power production by Brookhaven National Laboratory scientists at the recent international congress of the American Institute of Chemical Engineers at Ann Arbor, Mich. Compared with five reactor designs already made public, the LMFR outlined by the scientists from Upton, L. I., is notable for these advantages:

1. High specific power.

2. High-temperature operation and thus high thermodynamic efficiency, with high pressure in the reactor.

3. Neutron economy sufficient to give some breeding with resulting low-fuel costs.

4. Relatively simple construction.

5. Easy fuel handling by pumping.

6. Cheap chemical processing to remove fission products, integrated into the reactor design.

7. Lack of radiation damage to liquid-metal fuel.

8. Unlimited burn-up of fuel.

9. Removal of relatively fresh fission products in concentrated form, allowing a reduction of the exclusion area. Fission-products may be useful by-products or at worst can be easily stored wastes.

Because the LMFR concept embraces unconventional materials and processes outside present engineering experience, many problems require solution before a large pilot reactor can be designed. Pilot operating experience is a prerequisite to choosing the most economical plant design. Views presented by Brookhaven scientists before the assembled chemical engineers are abstracted below.

Fuel Selection . . . As fuel, the LMFR would use a liquid-metal solution or dispersion of U^{233}, and it would breed the U^{233} from thorium.

As bismuth, lead, and tin have low melting points and low cross sections, their alloys and dispersions were investigated at Brookhaven as possible LMFR fuel and breeder materials. More complex combinations of metals were discarded in favor of a solution of uranium in bismuth. Even though the solubility of this solution is not large, nuclear calculations indicated that a properly designed reactor would utilize it as fuel. Solubility limits need not be exceeded to obtain a feasible temperature cycle at concentrations of 600 to 1,000 parts per million. This dilution gives high specific power and contributes to reactor efficiency.

Bismuth has a suitably low cross section and, like liquid metals generally, is expected to be free from radiation damage. Solutions of uranium in bismuth have a solubility of about ½ % at 500 C, more than ample for a chain reaction in an enriched-fuel reactor.

Heat Exchange . . . High heat fluxes in the heat-exchange components of reactors are required to keep reactor size and fuel inventory within reasonable limits. Liquid metals have their particular application in high-flux, high-temperature heat transfer because of their high thermal conductivities and low viscosities and vapor pressures. In all power reactors, especially those externally cooled, core

design and size are controlled more by heat transfer than by nuclear considerations. Such important reactor characteristics as fuel inventory, burn-up time, specific power, and in the case of breeders doubling time are other functions of core design and size. A compromise among these normally opposing factors must be reached.

Because neutron economy is critically important in thermal breeder reactors, the carrier metal in the fuel mixture and the primary coolant in internally cooled reactors must have low absorption cross sections. Bismuth meets this requirement: It is the best coolant as well as carrier metal for the fuel. It has a relatively low melting point and can dissolve appreciable amounts of uranium. Limited production of bismuth is another reason for minimizing fuel requirements.

In the internally cooled reactor design proposed by the Brookhaven scientists, the primary coolant is also the breeding mixture as bismuth can contain a suspension of thorium bismuthide. In thermal breeders, reactors "burning" and producing U^{233}, the number of neutrons produced per neutron absorbed is such that relatively few neutrons can be allowed to be captured by nonfertile or nonfissible materials, even when the reactor produces only as much uranium as it consumes.

Internal vs External Cooling . . . Unlike reactors using solid fuel elements, the LMFR can be cooled either internally or externally. The fuel can remain inside the core and therein transfer its heat to a primary coolant, or it can be continuously circulated to external heat exchangers where it transfers its heat to the secondary coolant (sodium). The choice between them depends on the purpose and design characteristics of the particular reactor.

External cooling permits:

1. Smaller reactor core because the fuel is the primary coolant and there is no structure separating fuel and coolant streams.

2. Simpler reactor construction and, consequently, fewer thermal-stress problems.

3. Heat exchangers having better heat-transfer coefficients.

4. Less critical leak problem and greater operating reliability.

5. Rapid fuel circulation permitting prompt removal of gaseous fission products.

6. Rapid fuel circulation permitting better control of reactivity (Fuel concentration can be changed quickly by adding or removing fissile material as fuel is circulated).

7. Secondary coolant having a high cross section.

8. Greater design flexibility and fewer restrictions on choice of materials because heat transfer and fission processes are separate.

Internal Cooling . . . Internal cooling permits:

1. Lower fuel inventory.

2. No radioactive steam because the primary coolant heats steam-generating equipment outside the core.

3. Secondary coolant that is not radioactive.

4. Primary coolant that can also be the breeding stream.

For internal cooling, the structure separating the fuel from the coolant should have a large heat-transfer area, low thermal-neutron absorption cross section, high thermal conductivity, sufficient strength to prevent cracks and ruptures, and satisfactory resistance to corrosion by high-temperature fuel and coolant.

Materials . . . No ideal structural material exists. Several good metals are eliminated by their high neutron absorption. Graphite is reasonably good from most standpoints but is deficient in strength, and graphite tubes are impractical. Fuel and coolant, however, can be circulated in separate channels in large graphite blocks that have a minimum graphite thickness between streams and provide sufficient area for heat transfer.

From the neutron-absorption standpoint, bismuth is the best metal available as a liquid coolant. Other low-cross-section metals, such as Li^7 and Pb^{208} would be better, but being isotopes, are prohibitively expensive.

Secondary Coolant . . . Fission heat can be transferred directly from the liquid-metal fuel (primary coolant) to steam, or an intermediate coolant (sodium) can be used. Direct transfer has the advantage of eliminating the secondary coolant system with its heat exchangers, coolant, piping, and pumps. Direct transfer, however, has the following disadvantages:

1. Low over-all coefficients encountered with thick pressurized tubes and superheated steam necessitate large heat-exchanger units and correspondingly large fuel inventory.

2. Larger heat-transfer area increases probability of leakage.

3. High thermal stresses in tube walls result from large difference in fuel and steam temperatures.

4. Steam becomes radioactive, aggravating steam-plant maintenance, creating need for leak-tight steam and condensate lines, and introducing additional shielding problems.

5. Gamma-radiation decomposes steam and necessitates including an O_2-H_2 recombiner in the steam system, and the free oxygen corrodes condensate lines.

Breeder Blanket . . . Nuclear power fuel costs are low only when natural uranium or thorium is used. This implies that the fuel is replenished by breeding. In LMFR this is done in a breeder blanket surrounding the core and capturing excess neutrons leaking out to form the chain reaction in the core.

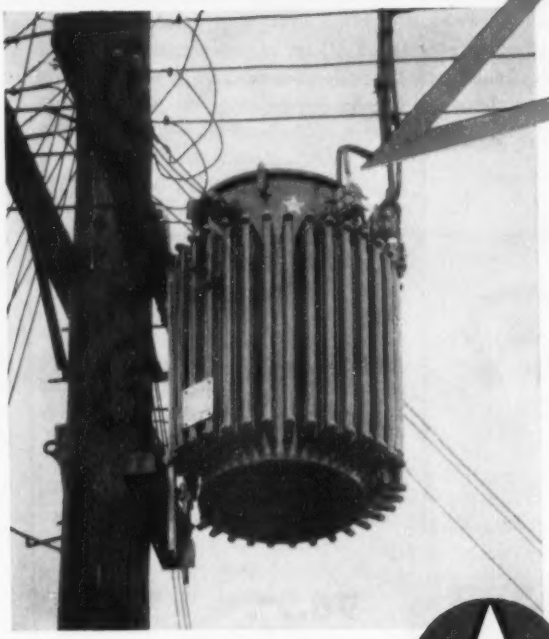
This blanket consists of a graphite moderator pierced by tubes holding fertile thorium dispersed in liquid bismuth as thorium bismuthide (Th_3Bi_5). Some heat produced in the blanket is removed by circulating to an external heat exchanger or by bypassing some fuel through the blanket.

In one plan the blanket material would be pumped to a processing plant and diluted with enough bismuth at high temperature so that all Th_3Bi_5 would go completely into solution. Protactinium and uranium formed by neutron capture would be removed by a modified fused-salt extraction. The uranium would be separated in a holdup tank and then stored for fuel makeup or sale.

An alternate blanket system, also proposed by the Brookhaven scientists, would use a solid salt, thorium fluoride, as the fertile material. This process depends on the rapidity of uranium or protactinium diffusion through thorium fluoride and on preparation and maintenance of fine enough thorium fluoride particles at the necessary temperatures. In this process the products would be separated out as separate gases, on the basis of widely different fluoride

(*Continued on page* 51)

Pennsylvania Transformer Company introduces the NEW 167 KVA *Feather weight* POLE STAR TRANSFORMER



167 Kva Featherweight Pole Star installed to relieve power shortage in congested business neighborhood. New "featherweight" transformer replaced 100 Kva unit to provide ⅔ additional capacity.

- **Will replace any single phase 75 or 100 Kva Pole-mounted Transformer to provide 67% to 123% more capacity**
- ★ **Weighs less than 1500 pounds**
- ★ **Lower in overall height than average 100 Kva transformer**
- ★ **Available in standard voltages up through 13,200 volts**
- ★ **The FIRST 167 Kva transformer made for direct pole mounting**

UTILITY ENGINEERS ASKED FOR THIS TRANSFORMER

The continuing increased demand for more power is presenting a problem to utility companies serving crowded urban areas. Many power companies with distribution lines located in congested neighborhoods prefer to supply this load through larger-rated pole-mounted transformers rather than resort to more expensive measures, such as underground installations, additional poles for platform mounting, etc.

However, many utility poles in use today are designed to carry a *maximum* of 1500 pounds of transformers. The average weight of all present-day 100 Kva cold-rolled steel transformers — and yesterday's 75 Kva hot-rolled steel transformers — is approximately 1450 pounds. Therefore, 100 Kva is the largest pole-mounted transformer that these poles can carry.

Pennsylvania engineers were advised of this problem and were asked to design a 167 Kva transformer (*the next standard size after 100 Kva*) that weighs less than 1500 pounds. *And that's what Pennsylvania did!* Its answer to this problem is the new 167 Kva featherweight Pole Star.

Mechanical Characteristics

Weighs less than 1500 pounds.
Conforms to EEI-NEMA Fifth Report except for additional brackets for direct pole mounting.
Overall floor space slightly larger than average for 100 Kva transformers.
Overall height approximately 8" less than industry average for 100 Kva transformers.

Electrical Characteristics

Regulation — Regulation in the new 167 Kva featherweight design compares favorably with that of the regular 167 Kva Pole Star.
Losses — The "featherweight" Pole Star is more efficient up to 60% loading and slightly less efficient above 60% loading.
Exciting Current — Low exciting current found in all Pole Star designs is also inherent in the 167 Kva featherweight design.

For further information on Pennsylvania's new 167 Kva Featherweight Pole Star, write, phone or wire your nearest Pennsylvania Sales Representative, or contact

DISTRIBUTION SALES DEPARTMENT

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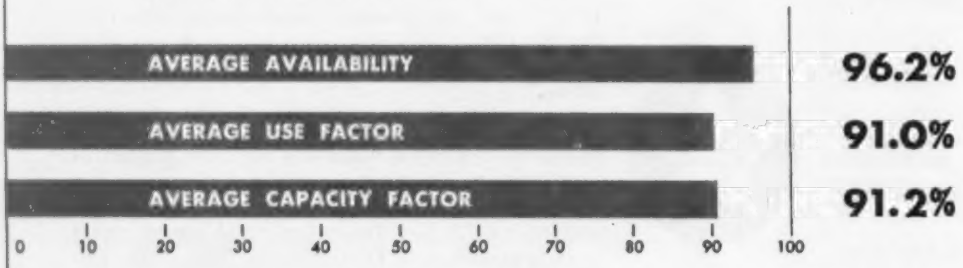
A McGraw Electric Company Division • **Box 330** • **CANONSBURG, PA.** • **Phone Canonsburg 2380**

"ON THE LINE" PERFORMANCE

50 C-E REHEAT BOILERS

There are 131 C-E Postwar Reheat Boilers in service, under construction or on order, representing an aggregate capacity of 15,497,500 kw or an average of 118,000 kw per unit. The first of these boilers was placed in service in September, 1949. By the end of 1953, fifty units were "on the line." The combined service of these 50 units represents a period equivalent to 66 boiler years. Significant data concerning them are summarized below.

Total Capacity — kw	4,852,500
Average Capacity per Unit — kw	97,050
Total Boiler — Hours	564,160
Total Boiler — Years	66



DISTRIBUTION OF TOTAL OUTAGE	PERCENT
Inspection	2.2%
Boiler • Superheater • Reheater Economizer • Air Heater • Desuperheater • Fuel Burning Equipment	0.9%
(Auxiliary Equipment) Valves • Fans • Soot Blowers • Miscellaneous	0.7%
TOTAL	3.8%

B-764

C-E **COMBUSTION ENGINEERING**

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BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS AND FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

volabilities. Natural Th^{233} plus a neutron gives Pa^{233} which is a fissionable fuel.

Speakers described to the congress a series of experiments in which a loop containing ThF_4 was placed in a Brookhaven reactor, and UF_6 continuously removed. In a design under consideration the blanket is circulated outside the reactor for cooling, and the ThF_4 processed in the flame of a fluorine torch.

Container Materials . . . As a container material, graphite appears to be satisfactory in contact with bismuth-uranium so that the moderator in the core need not be clad. A metal is needed for heat-exchanger tubes, however, and probably for the outer container. Mass transfer is the problem, just as in the development of the mercury boiler and turbine. A similar solution, the use of inhibitors, has proved experimentally satisfactory with bismuth.

One Brookhaven paper described how several steel loops were filled with uranium-bismuth and subjected to high temperature on one side to correspond to the heat the fuel would carry leaving the LMFR core. In some iron-chromium alloy containers, the fuel dissolved so much of the container that the loop become plugged. Addition of zirconium and magnesium to the fuel virtually eliminated corrosion of container alloys. A tiny amount of zirconium, made radioactive, clings to the inside of the loop, retarding dissolution of iron into the fuel system.

These corrosion experiments, it was pointed out, afford confidence that uranium-bismuth solutions with inhibitors can be circulated in commercially available alloys. Studies are continuing on possible containers for operation above 600 C.

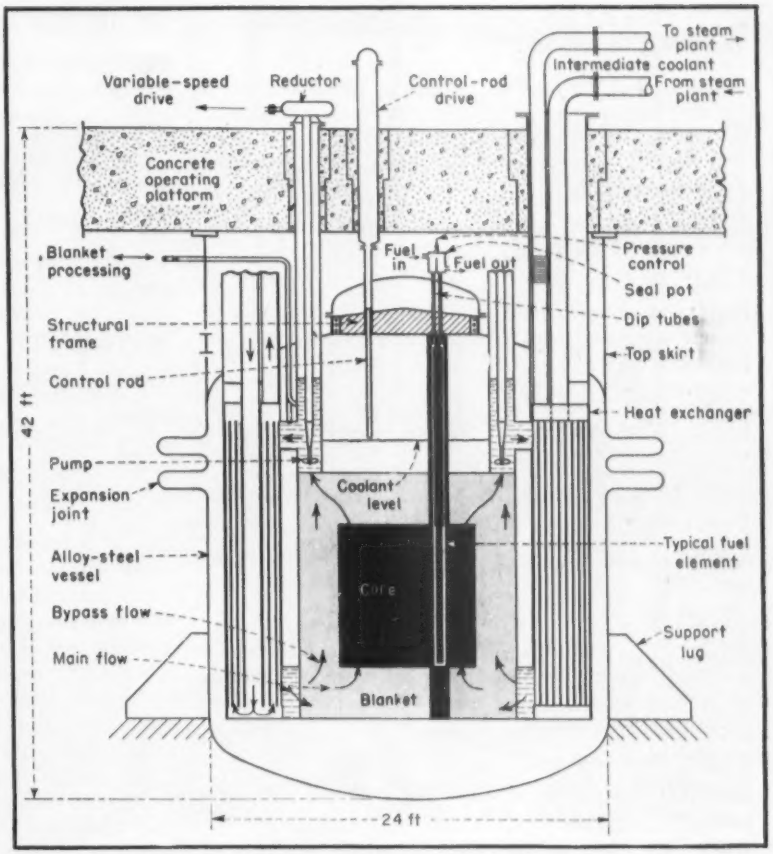
Removal of System Materials . . . The critical feature of LMFR is integration of chemical processing with the reactor. Several different processes act on the uranium-bismuth fuel.

Some bismuth probably will distill off, carrying polonium formed by neutron capture with it. Although separated polonium is an undesirable material, polonium dissolved in bismuth poses no greater hazard than the fission products. The distilled bismuth and polonium could be remelted and returned to the fuel. By-product polonium which is separable by fractional distillation has a value which could pay for any additional precautions it demands.

Initial laboratory experiments in miniature, according to another Brookhaven paper, have established that a melted mixture of potassium chloride and lithium chloride removes fission products from liquid bismuth without reacting with uranium present in the liquid. This finding indicates the feasibility of shunting fission products to storage or processing tanks and returning bismuth-uranium fuel to the reactor core.

Rare Earth Metals . . . The most important of the fission products are rare earth metals, elements of intermediate weight produced when uranium atoms split in two. Their extraction from the liquid-metal fuel is practicable by contacting it with a fused salt. Uranium is left in the bismuth solution as a result of this process.

Research on this processing, according to Brookhaven papers, has proceeded along two main lines. The thermodynamics have been used to explain the theory of the process, and circulating loops in which fuels are contacted with fused salts have been built to obtain engineering data. The tests included the use of radioactive rare earths as tracers to determine the extent to which these elements distribute themselves between the salts and the bismuth. The theoretical interpretation of the test data, it was pointed out, may assist in other applications, such as salt-metal extraction processes for thorium-containing breeder blankets in the proposed LMFR system.



INTERNALLY COOLED REACTOR is so called because the liquid-metal fuel remains inside the core and therein transfers its heat to the primary coolant which is also uranium thorium

Langer Hearing on Power Contract

(*Continued from page* 10)

DAVIS: "You did not say to Mr Von Tresckow that you were going to pull out?"

SLOAN: "No. We said we refused to participate."

• • •

DAVIS: "Was anything said to you by anyone to indicate that you might lose some business if you went ahead with the Von Tresckow group?

SLOAN: "No."

DAVIS: "More specifically, was anything said to you by anyone connected with Middle South Utilities that you might lose some?"

SLOAN: "No."

DAVIS: "What about anyone connected with Southern Co?"

SLOAN: "No."

DAVIS: "Anyone connected with Atlantic City Electric Co?"

SLOAN: "No."

DAVIS: "Anyone connected with the New Orleans Public Service?"

SLOAN: "No. . . ."

DAVIS: ". . . . Did anyone from any of these companies get in touch with you directly or indirectly and indicate in any way that if you went ahead with the Von Tresckow group you might lose some business?"

SLOAN: "Absolutely not."

KEFAUVER: "Or did any of them talk with you about the matter?"

SLOAN: "We called Mr [Bayard L.] England [president of Atlantic City Electric Co] and we also called Mr [Dan C.] Hess [vice president of Indianapolis Power and Light Co] who are public utility clients of ours when we found out about this situation. They are familiar with the fact that we had been trying to reach the negotiation stage with the New Orleans Public Service because we had representatives of New Orleans Public Service visit their plants. We told them that this publicity which we had received was being retracted and that we were not identified with this TVA project."

DAVIS: "Can you tell me how it would be detrimental to the private utility industry of this country if you were to perform these engineering services for the Von Tresckow group?"

SLOAN: "As I told you, with the negotiations on which we had under way with New Orleans Public Service, we did not feel we could put ourselves in a position where they could say we would have a divided interest, which we would have if we became a part of Mr Von Tresckow's proposal."

SEN HARLEY M. KILGORE (West Virginia Democrat): "Inasmuch as this plant was in the Memphis area, how could it be detrimental or competing with a New Orleans project?"

SLOAN: "The New Orleans Public Service is a subsidiary, one of the operating companies owned by Middle South, Senator."

Von Tresckow Version

DAVIS: "Did they say they couldn't stand the pressure which was being exerted on them?"

VON TRESCKOW: "Yes, sir."

DAVIS: "Did you ask them what pressure, or what they meant by that."

VON TRESCKOW: "Well, that the pressure was being exerted, obviously, was by the Dixon-Yates group on their present customers."

DAVIS: "Will you tell us what they said?"

VON TRESCKOW: "Well, in detail, it is very difficult. It is difficult to remember actually the words, because they didn't say. However, the sense of the conversation certainly is this: The regretfulness, and they asked me whether I would blame them for it; and I said, 'No, I don't blame you at all, and I would do the same thing if I were in your position, because you cannot afford that kind of pressure.' "

The Letter

Text of the letter referred to by Sloan follows:

"Dear Mr Von Tresckow:

"In our original discussion we had no knowledge of the fact that any private utilities were interested in the construction and operation of a generating station in Tennessee Valley area for Atomic Energy Commission.

"It now develops that unauthorized use of our name has been made in connection with a proposal to the Atomic Energy Commission counter to one submitted by Middle South Utilities and The Southern Companies.

"On April 28 we pointed out to you that Gibbs & Hill, Inc. could not afford to have its name linked with any endeavor contrary to the interests of any privately owned public utilities in this country.

"The use of our name has come to the attention of Mr Dixon, president of Middle South Utilities and through him to Mr [Bayard L.] England, president of Atlantic City Electric, one of our clients; and to a number of electrical equpiment and boiler manufacturers. One of the subsidiaries of Middle South Utilities is the New Orleans Publice Service Co, with whom we have been endeavoring to negotiate an agreement for the design and/or construction supervision of their new station.

"In view of the foregoing it would seem necessary to have statements issued in such newspapers as Gibbs & Hill's name has been mentioned in connection with this project, to this effect:

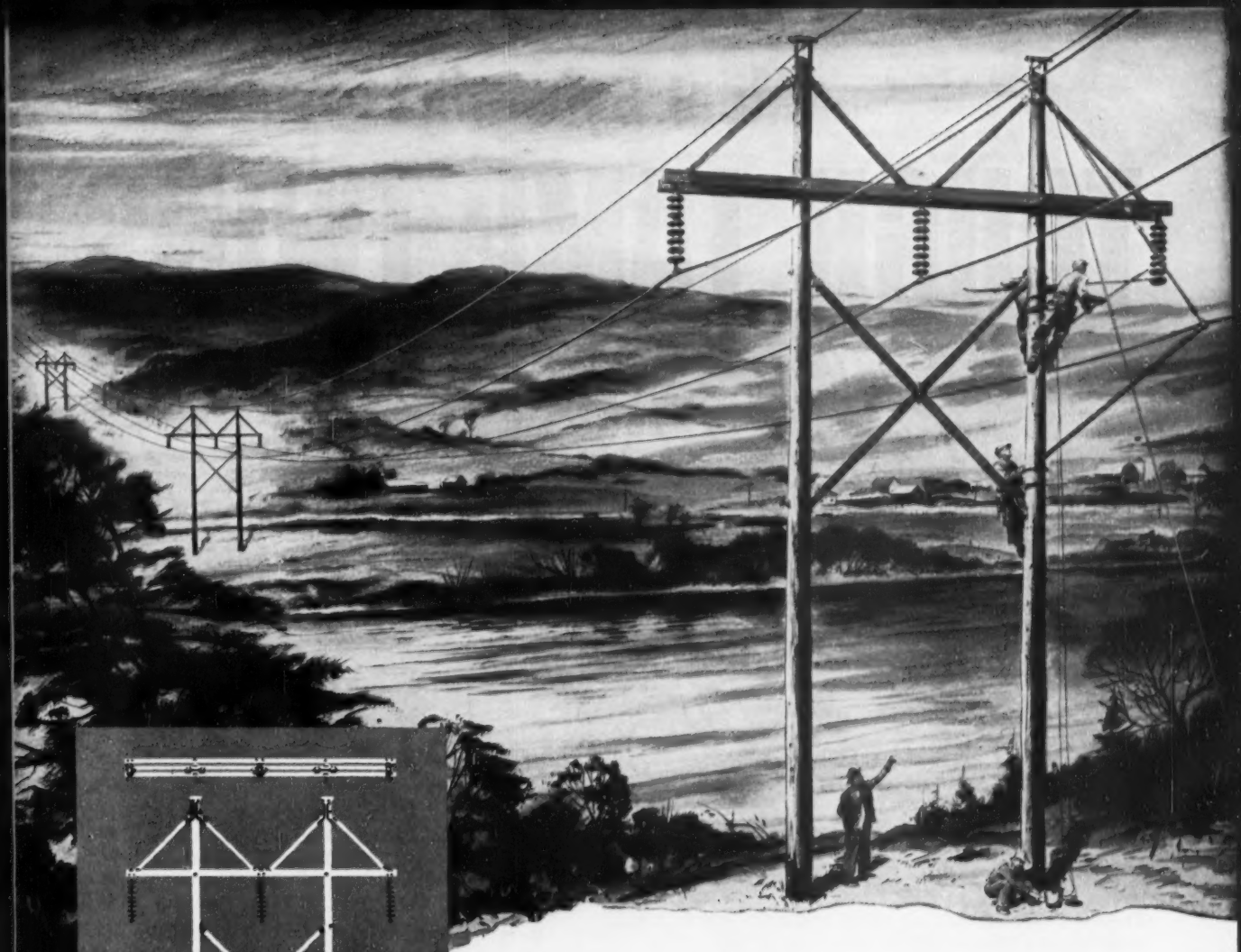
—"THAT WE WILL NOT PARTICIPATE IN ANY ACTIVITY DETRIMENTAL TO THE PRIVATELY OWNED PUBLIC UTILITY INDUSTRY IN THE COUNTRY."

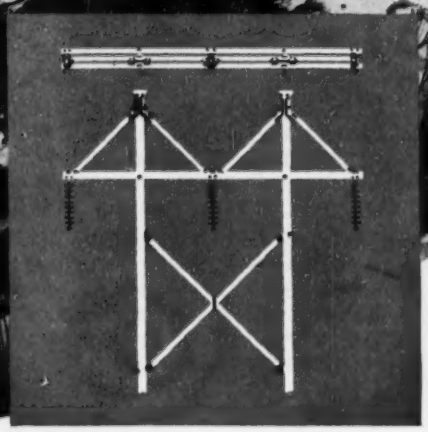
"Any personal names or company names used above are confidential and have been mentioned for the sole purpose of adequately presenting Gibbs & Hill's position.

"Yours very truly,

"David B. Sloan . . ."

(Electrical World will carry a detailed account of testimony given by private utility witnesses when they appear before the Langer subcommittee.)





Type No. 702 —
Tangent Structure with braces . . .
for voltages 69 to 154 KV*

LIST OF MATERIAL

Quantity	Description
2	Crossarm
3	Steel spacer w/mounting bolts
2	Stud bolt ⅞" w/washer nuts and locknuts
1	Bent stud bolt ⅞" x 8" w/2 sq. nuts
2	Bent bolt ⅞" x 5½" w/sq. nut
4	Vee Brace 3⅛" x 4⅜" cross section
1 set	Cross brace w/fittings, clamp, ⅞" pole bolts, curved washers
2	Static wire support
4	Machine bolt ¾" w/locknuts
2	Clevis
2	Suspension clamp for static wire
as req'd	Suspension insulators & fittings

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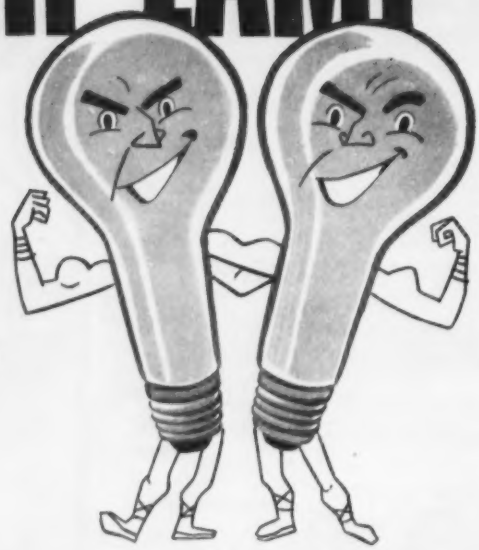


Two special lamps engineered to solve specific lighting problems.

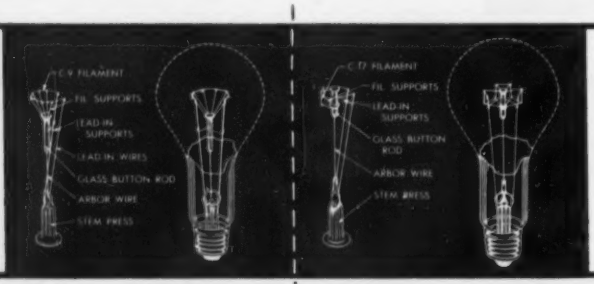
These 2 important Sylvania lamps look alike, but each is designed for a different kind of industrial service.

The Vibration Service Lamp is equipped with a special *flexible* tungsten filament held in place by extra filament supports. Thus it stays on the job longer when placed on or near fast-moving or vibrating equipment.

The Rough Service Lamp is engineered to resist jolts caused by rough handling. This lamp, too, has extra supports. In addition, its selected filaments are specially coiled to resist sudden shock.

Both of these lamps feature Sylvania's improved shock-absorbing mounts (see diagrams). These are formed of spring-steel arbor wire which protects the filament and glass button rod from heavy jolts and vibration. Every industry needs both of these "Tough Twins." Get them from your Sylvania supplier or write to Dept 4L-2819, Sylvania today!

†Showing construction detail of Sylvania 100 Watt Vibration Service Lamp and shock-absorbing mount.



*Note difference in the design of Sylvania's 100 Watt Rough Service Lamp.

SYLVANIA

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LIGHTING • RADIO • ELECTRONICS • TELEVISION

GOP Power Policy

(*Continued from page 9*)

the Idaho Power Hells Canyon project, a similar or faster time schedule is expected to be required.

Whenever it gets a chance the Administration is certain to step up construction on projects. It is set on encouraging local interests to exceed the pace at which hydro development was carried on under previous administrations.

Slow-Paced Program

On big main stem projects where no local interest is anxious to step in, the federal government intends to continue a slow-paced program. That's the reason for the Administration effort to gain authorization of the $1-billion Upper Colorado project. There are a number of lesser power projects on the Administration's planning boards. If local development does not come along at a satisfactory rate, the federal government will increase its own program.

Republican policies face rough going on a couple of big issues:

A White House order to hold back expansion of generation facilities by Tennessee Valley Authority and buy power from a privately financed plant is bringing angry criticism from public power and TVA backers. Because Atomic Energy Commission is involved in the proposed deal, legislators threaten to block the brand new atomic energy bill which would foster industrial development of atomic power.

FPC hearings drew to a close last week on Idaho Power Co's bid for a license to build a $133 million hydro project on the Snake River, but a final decision is still months away. Public power forces have strung out hearings on the three-dam project for more than a year with an eye to making the project an issue in this year's Congressional elections in the Pacific Northwest.

At the other end of the country, federal withdrawal from the Niagara power project did little to settle matters. It is still a hot contest between the five leading electric companies in New York and the N. Y. State Power Authority. Unless there is an unexpected break, it looks as if the Niagara project will continue as a stalemate at the end of the current session of Congress.

Priest Rapids Power Bill Is Approved by Senate

The Senate last week approved legislation that clears the way for developing the Priest Rapids power site in Washington as a local rather than federal project. The Priest Rapids Dam and reservoir was approved by the Flood Control Act of 1950 as an integral unit in the overall plan for flood control in the Columbia River Basin.

The legislation, already approved by the House, would modify the 1950 authorization insofar as Priest Rapids is concerned to permit the development of the site by Public Utility District No. 2 of Grant County, Wash., under a license issued by the Federal Power Commission. In approving the measure, the Senate voted down an attempt to extend the preference clause to privately developed power.

The utility district, under the legislation, would concern itself only with power development aspects of the project. The proposed power installation consists of some 23 53,000-kw generators initially, a total of 1,219,000 kw.

Flood control and navigation aspects of the project would be undertaken by the federal government. Total estimated cost of the project is $364 million. Of this, $65 million would be for flood control storage and $10 million for navigation facilities, both to be borne by the federal government. The utility district would finance the power aspects through sale of revenue bonds.

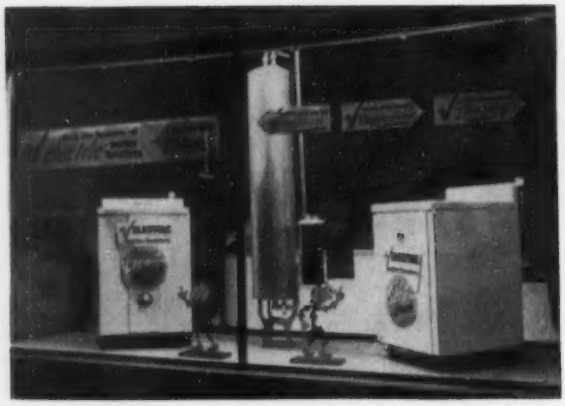
The Senate knocked out a section of a committee amendment that would permit the Bonneville Power Administrator to use money from his continuing fund to buy surplus power from the project, for distribution over the Bonneville grid for sale at rates in accord with the Bonneville project act. The action came on a motion by Sen Guy Cordon (R-Ore.) who asserted that giving the administrator such unlimited purchasing authority might mean that in time so much of the Priest Rapids power output might be taken by Bonneville that little would be left for private power customers. BPA would be allowed to buy Priest Rapids power only with funds appropriated by Congress.

The measure now goes to conference .

Hells Canyon Hearing Ends—on High Level

Still smiling behind the 19,215 pages of transcript amassed during more than a year of hearings is John Mason (above), Federal Power Commission attorney. Hearings in Washington on the Idaho Power Co application for a license for the three-dam development began in 1953 and ended July 9. In all 37 full weeks were devoted to the hearings.

DEALER MEETINGS were held to explain plans and promotional ideas. A similar series of meetings was held with plumbers' groups



WINDOW DISPLAYS, extolling benefits of electric water heaters, were placed in company offices, in dealers' and plumbers' stores

Joint Activity Sells 8,065 Water Heaters

C. W. AILSTOCK, Director of Residential Development, Florida Power Corp, St. Petersburg, Fla.

The sales impetus gained during a three-month campaign by Florida Power Corp resulted in the sale of 8,065 electric water heaters during 1953. This was 35% over the quota set at the beginning of the year. A total of 1,875 water heaters was sold during the three-month campaign.

This record is all the more significant since the saturation of electric water heaters in Florida Power territory is 41.1% as compared with a national saturation of 14.1%. Total cost of promotion for the three-month campaign was only $5,328 or $2.84 per heater sold. Based on EAR of $61,875, this promotion cost only amounted to 8½¢ per dollar of revenue. In recognition of these results, this activity won the EEI Hughes Award for outstanding achievement in water heater promotion.

Twenty-five years of water heater promotion served as a focal point for this "Silver Jubilee Campaign" sponsored and promoted in '53 by the utility company. The three-month campaign was set up to include not only appliance dealers but plumbers as well.

Florida Power Corporation is not a merchandising utility, so that all appliance sales were made through dealers and plumbers. At least partially responsible for the excellent results of the water heater campaign was the strong dealer-cooperative program which was inaugurated by the utility in the post-war period. Cooperative advertising and promotional activities, plus a planned dealer sales program, have fostered good relations with dealers and produced excellent sales results each year since its inception. This spirit of cooperation between utility and dealer was the major factor in generating enthusiasm which resulted in a highly successful water heater campaign as well as sending total electric appliance sales soaring to an all-time high in the company's service area.

The actual working plan of the Silver Jubilee Campaign was simple yet proved to be very effective. In the planning stage, it was decided to include plumbers in the activity since they have become a potent ally in water heater sales, particularly in the last few years. With this in mind, the company's residential sales force set up a series of meetings with plumbers and appliance dealers throughout the company's territory.

A booklet, keyed to the Silver Jubilee theme, was prepared. The booklet outlined the time limits, the rules and the rewards of the campaign. At the dealer meetings, a copy of the booklet plus promotional material in the form of window streamers and customer hand-out pieces were distributed. Company plans on advertising and promotion were also presented at the meetings. An interesting sidelight of the meetings was the fact that sales training was injected at every session. The advantages and benefits of electric water heating were discussed and also included in the printed brochure.

During the campaign, a series of ads promoting the advantages of electric water heaters was run in 80 daily and weekly newspapers throughout the company's service area with the tag line "See Your Appliance Dealer or Plumber." Publicity and progress of the campaign were covered extensively in the company's dealer publication "Reddy's Dealer Service News." This publication is sent to dealers, plumbers, electrical contractors, distributors and manufacturers of electrical appliances. Window and counter displays promoting electric water heaters were set up in the company's offices, and the dealers and plumbers were urged to tie-in with both displays and advertising.

The company's residential sales representatives and home service advisers were extremely active during the campaign. Each home service adviser was instructed to include the advantages of electric water heating whenever possible in each of her demonstrations. The sales representatives in their routine customer calls uncovered prospects which were distributed on an equitable basis to the participating dealers and plumbers.

More emphasis was placed on re-

placement sales in the incentive plan, but there were rewards for new sales and tips also. The "pay-off" was made in silver dollars to carry out the Silver Jubilee theme. Any person in an appliance dealer's or plumber's store, other than sales personnel, received a silver dollar for turning in a tip that resulted in a sale. Three silver dollars were paid to the salesman for each sale that replaced another type of fuel—two silver dollars for the sale of any new electric water heater which was not a replacement.

New Large Heat Pump

A new packaged air-source heat pump, claimed to be the largest of this type on the market, is being produced by the General Electric Co.

The new unit, designed for larger homes and commercial buildings, is powered by two modulated 5-hp compressors and will handle up to 3000 cu ft of air per minute. It features a completely sealed hermetic refrigeration system warranted for five years. Designated the 98B, it will supplement the present line of 3 and 5-hp models.

Electric Hot Water for the Farm

A new sound-slide film in full color —"Hot Water Saves Labor"—has just been released by the Electric Water Heater Section of the National Electrical Manufacturers Association.

This film tells the story of automatic hot water uses on the farm—both in the farm home and on the farmstead. It runs for fifteen minutes, and sound is included on a record, so no narration is needed. It will be particularly useful for showing at farm group meetings. It provides the kind of instructive entertainment that not only will be helpful to the viewer, but is designed to stimulate audience enthusiasm.

Also available for distribution when the film is shown is a new, revised edition of the booklet—"The Modern Automatic Electric Water Heater." It is planned specifically for use with the film. This booklet well describes what automatic, electric hot water means on the farm—just as the audience has seen its application in the film. It illustrates how important electric hot water is to modern living on the farm in terms of labor-saving, time-saving, and family health.

A print of the film, with record, and 100 copies of the booklet, are being offered for the nominal price of $7.95 by the Electric Water Heater Section, National Electrical Manufacturers Association, 155 East 44th St, New York 17, N. Y.

Large Participation In Appliance Promotions

Some 107 private electric utility companies, serving more than 27,000,000 customers, have indicated that they are participating or have already participated in coordinated industry-wide electric range and electric water heater promotions this spring and summer. The activities were developed by the EEI residential promotion committee in coordination with NEMA and PUAA. This is the largest number of electric utility companies actively participating in any post-war appliance promotion sponsored by the Institute.

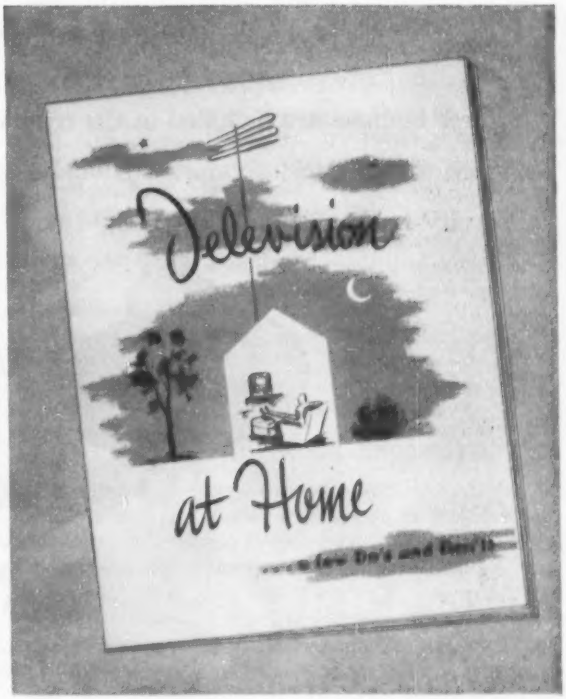
TV Spot Sparks Interest in Adequate and Proper Home Lighting

"The response was terrific. Telephone calls flooded a three-operator switchboard for over three hours. Supply couldn't begin to meet the demand." So reports San Diego Gas & Electric Co regarding a run on home lighting booklets offered over a company-sponsored television program.

It all began when the company became curious about the audience size and acceptance of its 5-min, weekday TV round-up of the weather. A 1 min announcement during the round-up offered two booklets to everyone calling a number flashed on the screen. A deluge of 532 calls jammed the telephone-answering service for hours.

After this overwhelming response, the offer was used sparingly during the ensuing 13-week period. Supplies dwindled as requests totaling 3,894 continued to roll in. To bridge the gap while reprints were being made, a letter of apology was sent out to customers awaiting the booklets.

"Television at Home," the company's TV lighting booklet, and General Electric's "See Your Home In a New Light" were mailed in answer to all requests. San Diego G&E's booklet suggests five ways to more comfort while watching TV. These include adequate and proper lighting, viewing at a proper distance, and correct adjustment.



LIGHTING BOOKLETS offered on company-sponsored TV show brought deluge of 3,894 telephone calls. To view TV in comfort, booklet offers suggestions for lighting, viewing distance and set adjustment

Two Big Bonuses—

Yours—when you purchase Locke Insulators

Two important bonus values are yours every time you order Locke Insulators.

BONUS #1

Ready to serve you is Locke's highly trained field service organization. It is the insulator industry's most competent factory-employed nation-wide technical service group. Call upon us freely . . . for help on any insulation problem . . . routine or emergency.

BONUS #2

"Thanks for your order!" is just the beginning . . . *not the end* . . . of our obligation to you and your company. At your service are the facilities of the world's best-equipped high voltage and research laboratories. Take advantage of them . . . whether your insulation problem is one of preliminary design, construction or operations.

These bonuses are included in the regular price of a Locke Insulator. They add immeasurably to its value. Obviously, you get more for your money when you specify Locke.

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

Aluminum-Sheathed

. . . cable production by the direct-extrusion method is planned by General Cable

Plans for the first American production of cable aluminum sheathed by the direct-extrusion method have been announced by General Cable Corp. A press has been purchased in West Germany and will be installed in one of the company's eastern plants.

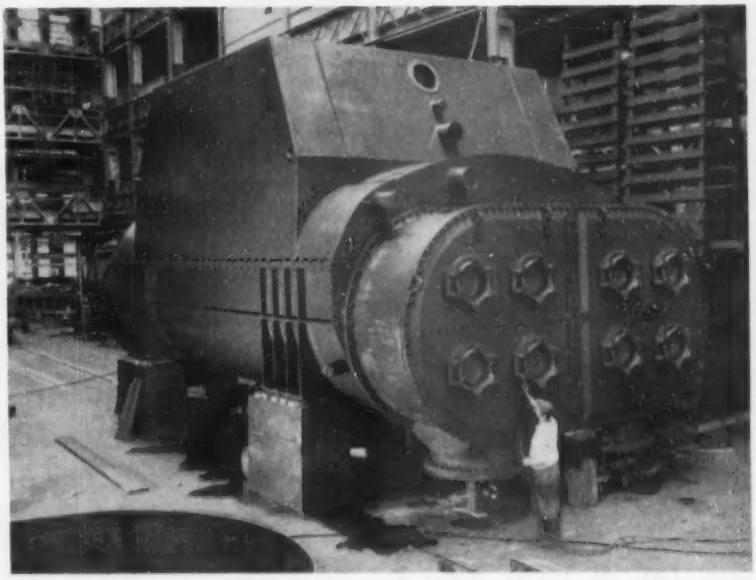
Europeans have led the way in the extrusion method of sheathing cable with aluminum. The British (EW, July 5, p 59) and the Russians have such presses operating at somewhat low rates of production. There are several thousand miles of aluminum-sheathed cable installed in Europe. Nearly all of it was produced by the strip or draw-down methods.

J. R. MacDonald, president of General Cable Corp. predicted that the new aluminum sheathing process might make posible new designs of very high voltage overhead power cables, lighter communication cables for aerial installations, improved television (coaxial) cables, and quite possibly longer spans.

He said also that:

"We plan to undertake development programs leading to the production of many new products in which aluminum will be employed not only for a protective covering but also will serve other uses."

Oscar G. Garner, vice president in charge of plant engineering; Dr. Louis Meyerhoff, director of research; and Martin H. McGrath, chief electrical engineer, have done research on the problem of extruding aluminum sheathing and have made many trips to Europe to study foreign developments.



Milliken Gets 620,000-Lb/Hr Condenser

A 70,000-sq ft condensing unit for the new Milliken Station of New York State Electric & Gas Co has been delivered by the Worthington Corp. The unit will be used with a 135,000-kw turbine-generator and will condense 620,000 lb of steam per hour using water (55F year around) from Lake Cayuga at the rate of 84,500 gpm. The picture gives an indication of the size of the condenser, 40.5 by 19.6 by 27 ft.

Daystrom Buys Weston

Daystrom, Inc, Elizabeth, N. J., has acquired voting control of 189,000 shares of Weston Electrical Instrument Corp, Newark. This is 44.1% of the 428,221 Weston shares outstanding. Only 73,000 of the shares are owned outright, but Daystrom is buying a block of 116,000 shares from an investment group over a two-year period. Daystrom stockholders have voted to increase the company's capital stock from 1,250,000 shares to 2,200,000 shares of which 200,000 will be preferred.

Square D to Move Some Operations to Royal Oak

Unable to expand its headquarters plant at Detroit because of lack of space, the Square D Co has acquired a 19-acre site in Royal Oak, a Detroit suburb. Construction will begin this month on a $750,000 building to house heavy equipment manufacturing and a sales office. Occupancy is planned for early in 1955.

The Detroit plant will be kept in operation, and executive offices will remain there. A limited number of skilled heavy equipment workers will be transferred to Royal Oak. The company plans to add to the labor force later. The building is designed so that it is adaptable for expansion.

Babcock & Wilcox Designs Low-Cost Reactors

For $100,000 to $150,000 Babcock & Wilcox Co is ready to install an atomic research reactor. The designs are modified versions of the declassified "water boiler" and "swimming pool" reactors developed at AEC installations. The great need for atomic scientists is expected to make the reactors standard laboratory equipment at all large universities. Government approval, however, is needed before either of the reactors can be installed.

Blaw-Knox Expands

Blaw-Knox Co has opened the expanded facilities of its Power Piping and Sprinkler Division on Pittsburgh's North Side. Two production bays totalling 13,000 sq ft were added. Office quarters above enable the division to unite its administrative, headquarters sales, and engineering personnel.

Transformer Container

New fiber drum shipping container developed by Wagner Electric Corp of St. Louis 14, Mo. is claimed to save 25% in storage space and reduce damage to transformers in transit. Distribution transformers rated 3-10 kva are packed in 8-ply fiber drums fitted with special cover and closure to protect transformers from dirt, grease, and weather.

Transformers are secured by bolting the mounting brackets to side of drum, and fiber sleeves are used for additional bracing where necessary. Substantial freight savings have been made with use of the fiber container which weighs 35% less than crates formerly used. In addition, Wagner finds the drums are easier to handle.

MANUFACTURING BRIEFS

Aluminum Co of America has begun experimental operations at its Vancouver, Wash., extrusion plant. Cable manufacturing facilities will be ready later this year.

Elwell-Parker Electric Co, Cleveland, has changed its trademark to ELPAR. The company makes industrial trucks.

Sylvania Electric Products Inc of New York under contract with the Navy's Bureau of Ships has developed a rugged, stacked-type construction for electron tubes. Including a ceramic instead of glass envelope, the design is said to be readily adaptable to automatic production methods.

Reynolds Metals Co has announced a $2,585,000-program to expand and modernize its aluminum sheet mill facilities at Sheffield, Ala. New melting equipment will have an annual capacity of 90 million lb.

States Co, Hartford, Conn., has completed a two-story building providing an additional 4,000 sq ft of operating space. The building houses offices and a display room and makes possible increased production of test equipment for relays, watthour meters, and transformers.

Westinghouse Electric Corp will expand its Small Motor Div by constructing a new plant at Upper Sandusky, Ohio. Present plans call for a one-story building with 60,000 sq ft of floor space on a 20-acre site. Cost, including machinery, will be over $1 million. Initial employment will be about 165 persons when production gets underway sometime in 1955. The plant will make motors having smaller frames than permitted by present facilities of the Small Motor Div.

Labor . . . Kennecott Wire & Cable Co, Phillipsdale, R. I., and IBEW-AFL agree on 5¢ per hr wage increase . . . General Electric Co, Newark, N. J., employees in NLRB election in four plants choose IUEW-CIO as bargaining agent.

Howard Electric Co, Chicago, has been formed as a subsidiary of Howard Foundry Co, Chicago, to manufacture a reportedly new type of electrical underfloor system for industrial and office buildings.

General Electric Co, Lynn, Mass., has taken an additional step in its decentralization program by dividing the Lighting and Rectifier Department into two separate departments: Rectifier and Outdoor Lighting. The Meter and Instrument Department at West Lynn has also been divided into two separate departments. The Meter Department will make its headquarters at Somersworth, N. H.

Baxco Corp has expanded its wood preservation pressure treating plant at The Dalles, Ore. Facilities provide treatment with pentachlorophenol, chemonite, and creosote. A pressure treating cylinder, 7 ft dia and 132 ft long, has been installed.

MEETINGS CALENDAR

World Power Conference
Sectional Meeting, Rio de Janeiro, Brazil, July 25-Aug. 10.

Pan-American Federation of Engineering Societies
(UPADI), Third Convention, Sao Paulo, Brazil, Aug. 2-12.

***Southeastern Electric Exchange**
Personnel Administration Section, Grove Park Inn, Asheville, N. C., Aug. 19-20; Engineering and Operation Section, Thomas Jefferson Hotel, Birmingham, Ala., Sept. 23-24; Accounting Section, Roanoke Hotel, Roanoke, Va., Oct. 28-29; General Sales Conference, Roosevelt Hotel, New Orleans, La., Oct. 28-30; Employee and Public Information Section, Roosevelt Hotel, New Orleans, La., Oct. 28.

***International Electrotechnical Commission**
50th Anniversary Meeting, University of Pennsylvania, Philadelphia, Sept. 1-16.

American Society of Mechanical Engineers
Fall Meeting, Schroeder Hotel, Milwaukee, Sept. 8-10; Annual Meeting, Statler Hotel, New York, Nov. 28-Dec. 3.

Rocky Mountain Electrical League
Annual Fall Convention, Stanley Hotel, Estes Park, Colo., Sept. 12-15.

Illuminating Engineering Society
National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., Sept. 12-16.

Public Utilities Association of Virginias
36th Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., Sept. 16-18.

Edison Electric Institute
Accident Prevention Committee, Benjamin Franklin Hotel, Philadelphia, Sept. 20-21; Industrial Relations Committee, Round Table Conference, Palmer House, Chicago, Sept. 27-29; Prime Movers Committee, De Witt Clinton Hotel, Albany, N. Y., Oct. 4-5; Electrical Equipment Committee, Hotel Statler, Hartford, Conn., Oct. 11-12; Prime Movers Committee, Astor Hotel, New York, Nov. 29-30.

American Institute of Electrical Engineers
Committee on Petroleum, Conference on Electrical Applications in Petroleum Industry, Mayo Hotel, Tulsa, Okla., Sept. 27-29; Middle Eastern District Meeting, Abraham Lincoln Hotel, Reading, Pa., Oct. 5-7; Fall General Meeting, Morrison Hotel, Chicago, Oct. 11-15.

National Electronics Conference
10th Annual Conference, Hotel Sherman, Chicago, Oct. 4-6.

National Association of Electrical Distributors
Pacific Zone Convention, Mark Hopkins Hotel, San Francisco, Oct. 4-7.

Indiana Electrical Association
Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 6-8.

Interstate Power Club
Meetings will be held at Hotel Martinique, New York, on following dates: Oct. 11, Dec. 6.

Pennsylvania Electric Association
Fall Meeting, Electrical Equipment Committee, Hotel Robert Treat, Newark, N. J., Oct. 19-20.

Public Information Program
Workshop Conference, Chase Park Plaza Hotel, St. Louis, Oct. 28-29.

National Electrical Manufacturers Association
Haddon Hall Hotel, Atlantic City, N. J., Nov. 8-11.

American Standards Association
36th Annual Meeting and 5th National Conference on Standards, Hotel Roosevelt, New York, Nov. 15-17.

*Addition this week.

WHERE DO STANDARDS FIT INTO THE PICTURE OF VALUE?

Do Standards define the performance of a station insulator? By meeting a specification for size, strength, and a series of electrical tests *before ever going into service*, can you assume durability under extremes of climate, unexpected stresses, or lightning attack? Can the insulator's ultimate life be predicted?

Rigid as Standards can be set up, they still assure only two things: Physical interchangeability and a minimum level of manufacturing skill. Standards don't determine quality -- in fact they merely establish the point *beyond which* quality is measured, and *beyond which* your dollar's worth is computed! The real investment value of an insulator lies beyond Standards. And in this non-standardized area, where the sound bargains exist, every manufacturer is still strictly "on his own."

So -- What if this is true. Can O-B offer any valid claim for its station insulators that will appeal to an intelligent buyer? Consider this: for over 30 years, O-B has been one of the largest suppliers of insulators. Quantity and time have been compounded. The greatest opportunity has been presented for trouble to show up. And in the face of all this, our oldest and largest users are still our best customers. They have had plenty of chance to find out, on their own terms, the truth of the statement, "There's something more in the crate besides an insulator, when that crate bears the 'O-B' monogram."

That "something more" is the biggest dollar's worth you can get today in station insulators!

Ohio Brass

MANSFIELD OHIO, U.S.A.

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4417-H

17 States Have Statutes on Fair Value

Of the 42 states and the District of Columbia having active commission regulation of electric utilities, 17 jurisdictions have regulatory statutes which require the determination of "fair value" or "reasonable value" for rate making, an Electrical World survey has revealed. Details are shown in the table below. In addition there is Texas which while it has no commission is a "fair value" state insofar as the law applies to "home rule" cities.

There are only four states that have no commissions. These are: Texas, Mississippi, Iowa, and Minnesota. While South Dakota and Nebraska have commissions they have no jurisdiction over electric and gas utilities. It should be noted in the case of Nebraska there are no private electric utility companies left for the commission to regulate.

It is of interest to note that of the 17 jurisdictions which have "fair value" or "present value" requirements prescribed by statute only 12 have had commission orders which tend to follow the statutes. If all "value" jurisdictions, using that term in its broadest sense are taken into account then it will be seen that only 12 out of 32 regulatory jurisdictions have followed their own statutes.

On the basis of regulatory statutes and interpreting the term value as above it would appear that of nearly $23 billion expended on plant as of the end of 1952, $16.5 billion were applicable or could have been applicable to "fair value" jurisdiction.

Methods of valuation used for rate making purposes by state and District of Columbia regulatory commissions:

State and Region	Regulatory Statute Based on	Commission Orders Based on	Amount of Gross Plant* (in millions)	Comments
Maine	Reasonable Value	Fair Value	$211	Fair value concept promulgated by decision of Superior Judicial Court of Maine.
New Hampshire	Net Book Cost	Net Book Cost	160	
Vermont	Not Defined	Net Plant	49	
Massachusetts	Not Defined	Prudent Investment	765	
Rhode Island	Not Defined	Net Investment	132	
Connecticut		Net Plant	364	Not clearly defined. Inference is that "fair value" is the state statute.
New England			1,681	
New York	Capital Expended	Net Original Cost	2,393	
New Jersey	Value	Net Book Cost	725	State Supreme Court ruled that fair value shall be the rate base.
Pennsylvania	Fair Value	Fair Value	1,970	
Middle Atlantic			5,088	
Ohio	Reproduction Cost Depreciated	Reproduction Cost Depreciated	1,516	
Indiana	Fair Value	Fair Value	747	
Illinois	Present Fair Value	Present Fair Value	1,725	
Michigan	Present Fair Value	Present Fair Value	1,064	
Wisconsin	Value	Net Book Value	598	This is substantially original cost less depreciation.
East North Central			5,650	
Minnesota			367	There is no state commission.
Iowa			361	There is no state commission.
Missouri	Capital Expended	Original Cost	559	
North Dakota	Prudent Investment	Prudent Investment	88	
South Dakota			39	No commission jurisdiction over gas and electric utilities.
Nebraska			.....	No commission jurisdiction over gas and electric utilities, in addition—there are no private electric utilities left.
Kansas	Value	Net Investment	207	

State and Region	Regulatory Statute Based on	Commission Orders Based on	Amount of Gross Plant* (in millions)	Comments
West North Central			$1,621	
Delaware	Fair Value	Fair Value	61	
Maryland	Fair Value	Fair Value	329	Generally based on net original cost plus 3% nominal addition.
District of Columbia	Fair Value	Net Original Cost	206	
Virginia	Value	Present Fair Value	345	Present "fair value" is recognized both by the commission and the Court of Appeals.
West Virginia	Not Defined	Average Net Cost	461	
North Carolina	Fair Value	Fair Value	620	
South Carolina	Value		107	No recent decisions with respect to electric utilities.
Georgia	Present Value	Average Investment	387	
Florida	Net Investment	Net Investment	409	Fairly liberal return, end of the year rate base and other earnings considerations.
South Atlantic			2,925	
Kentucky	Fair Value	(See Comments)	260	Commission has made no definite statement of its position since revision of the law in 1952.
Tennessee	Value	Net Average Investment	22	Few electric utilities left to be regulated.
Alabama	Fair Value	Net Investment	308	
Mississippi			130	There is no state commission.
East South Central			720	
Arkansas	Value	Net Original Cost Prudent Investment	179	
Louisiana	Not Defined	Prudent Investment	193	
Oklahoma	Value	Present Investment	259	
Texas	Fair Value		1,206	There is no commission but statute is applicable to "Home Rule" cities.
West South Central			1,837	
Montana	Present Fair Value	Present Fair Value	105	State Supreme Court ruling.
Idaho	Value	Net Original Cost	131	
Wyoming	Fair Value	Net Original Cost Net Investment	6	
Colorado	Value	Net Original Cost Net Investment	164	
New Mexico	Fair Value	Present Value	31	Substantially trended original cost.
Arizona	Fair Value	Fair Value	96	
Utah	Value	Investment Rate Base	140	
Nevada	Value	Net Original Cost	24	
Mountain			697	
Washington	Fair Value	Net Original Cost	225	
Oregon	Value	Net Original Cost	354	The commission allows acquisition adjustment to be included in the rate base.
California	Value	Net Plant	2,169	
Pacific			2,748	
UNITED STATES			$22,967	

Source—* Statistics of Electric Utilities in the United States—1952 published by the Federal Power Commission.

FINANCIAL

TVA Pays $10 Million to Retire 1939 Bonds

The Tennessee Valley Authority has sent a check for $10 million, part of an estimated $50 million to be paid this year, to the U. S. Treasury. Previously it had sent off $20 million to repay funds appropriated for its power system.

The money is to apply to retirement of bonds issued in 1939 primarily to finance purchase of private utilities. TVA said its budget for the 1955 fiscal year, which began July 1, contemplated repayment from power proceeds totaling $50 million.

TVA said this increase to $111,131,519 the amount the agency has refunded the government from power proceeds. The $10-million check reduced to $19 million the bonds still outstanding.

FINANCIAL BRIEFS

Utah Power & Light Co has received Utah Public Service Commission approval to bill its customers every two months instead of monthly. It will become effective July 31.

Homestead, Fla., is planning to sell $800,000 in electric and water revenue bonds to finance expansion of the city power plant.

Central Illinois Public Service has sold privately 50,000 shares of 100 par of 4¼% preferred stock.

Missouri Power & Light Co has asked the Public Service Commission approval to sell its water business in and around Excelsior Springs, Mo., to the town for a base price of $500,000.

California Public Utilities Commission has issued a final order approving the merger of Pacific Public Service Co into the Pacific Gas & Electric Co.

Institutional Investors Mutual Fund, Inc, owned common stocks in 16 electric and gas companies with a market value of $1,789,301 at June 30. The largest investment in the field was 4,800 common shares of American Gas & Electric Co, having a market value of $177,600.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
July 8	**2.88**	**2.94**	**3.16**	**4.02**	**4.12**	**4.45**	**4.64**	**4.93**	**5.39**
July 1	2.90	2.95	3.16	4.04	4.14	4.46	4.69	5.00	5.45
END OF QTR.									
2nd 1954	2.90	2.96	3.19	4.03	4.14	4.52	4.72	5.04	5.45
1st 1954	2.82	2.87	3.14	3.88	4.09	4.42	4.83	5.19	5.42
4th 1953	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.57	5.51
3rd 1953	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.97	6.01

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1954	Net Income 1953	Earnings Per Common Share 1954	Earnings Per Common Share 1953
Central Maine Power	5	May	$2,569,914	$1,824,092	$	$
City of Seattle—Dept of Lighting	12	April	5,479,836(a)	6,122,853		
Gulf States Utilities	12	May	9,611,847	8,030,861	1.91(b)	1.67(b)
Iowa Electric Light & Power	12	May	2,892,119	2,779,471	1.63	1.57
Philadelphia Electric, consolidated	12	April	30,646,009	27,943,518	2.41(c)	2.26(c)
Public Service Co of Indiana	12	May	11,989,259	10,804,311	2.33(f)	2.51(f)
Public Service Electric & Gas	12	March	8,918,954	9,274,988		
South Carolina Electric & Gas consolidated	12	May	4,309,948	2,908,932	1.23	.78

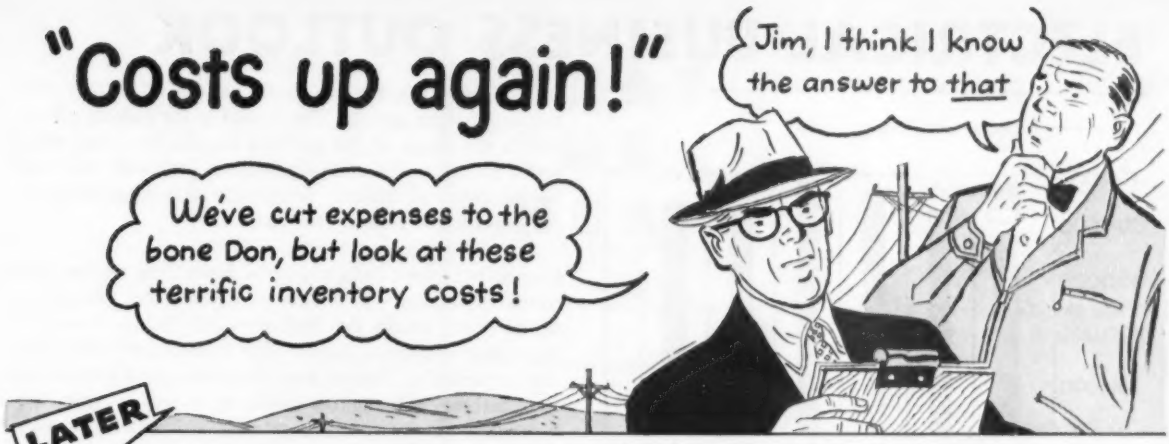
Notes—(a) After deducting $600,000 for miscellaneous reservations of net income; (b) Based on 4,221,832 shares in 1954 and 3,905,210 shares in 1953; (c) Based on 10,853,250 shares in 1954 and 10,699,702 shares in 1953, and (f) Based on 4,251,060 shares in 1954 and 3,780,768 shares in 1953.

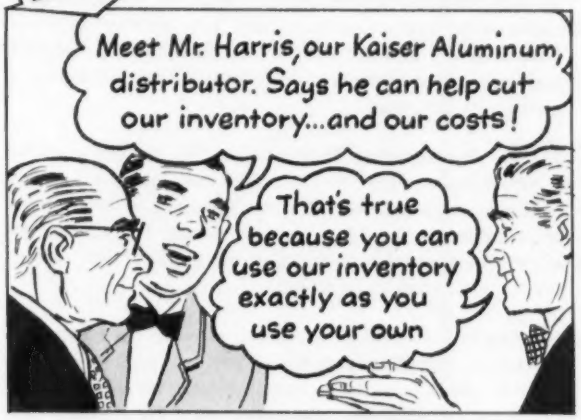
FINANCIAL

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF JULY 8-14			
Bonds			
Southwestern Public Service—1st mtg 3.20% due 1979	$20,000	100%	3.20%
Missouri Power & Light—1st mtg 3¼% due 1984	7,500	102.25	3.13
Preferred Stock			
Southwestern Public Service—80,000 sh 4.36% $25 par cum	$2,000	$25.00	4.36%
Public Service Co of New Hampshire—75,000 sh 4.50% $100 par	7,500	100.00	4.50
Common Stock			
Long Island Lighting—690,062 sh (being offered commonholders on 1-for-8 basis, record July 7 to expire July 22; unsubscribed sh to be sold to underwriters; 64,685 sh being offered to employees at a maximum of 200 shs each)	$13,629	$19.75	5.06%
SCHEDULED FOR JULY—AUGUST			**Bid Date**
Bonds			
Consolidated Gas, Electric Light & Power Co of Baltimore—1st mtg due 1989	$40,000	.....	July 19
Boston Edison—1st mtg due 1984	18,000	.....	July 26
Pacific Power & Light—1st mtg due 1984	30,000	.....	Aug. 9
Metropolitan Edison—1st mtg due 1984	3,000	.....	Aug. 15
Arkansas Power & Light—1st mtg due 1984	7,500	.....	Aug. 24
Southern California Edison—1st mtg	30,000	.....	Aug. 25
ISSUES RECENTLY POSTPONED			
Bonds			
Gulf States Utilities—1st mtg due 1984	$24,000	.....	.....
Consolidated Edison Co of N. Y.—1st mtg due 1984	50,000	.....	.....
Preferred Stock			
Missouri Public Service—50,000 sh $100 par	$5,000	.....	.....(a)
California Electric Power—105,000 sh $50 par	5,250	.....	.....(b)
Gulf States Utilities—160,000 sh $100 par	16,000	.....	.....
UNSCHEDULED, AND/OR UNDER CONSIDERATION			
Bonds and Debentures			
Indiana & Michigan Electric—1st mtg	$16,500	.....	Oct. 5
Long Island Lighting—1st mtg	20,000	.....	.....
Kansas Power & Light—1st mtg	10,000	.....	.....
Central Hudson Gas & Electric—1st mtg	10,000	.....	.....
Connecticut Light & Power—1st mtg	10,000	.....	.....
Central Illinois Electric & Gas—1st mtg	4,000	.....	.....
New Orleans Public Service—1st mtg	6,000	.....	.....
Kentucky Utilities—1st mtg	15,000	.....	.....
Rockland Light & Power—debs due 1974	10,000	.....	.....(c)
Northern States Power—1st mtg	20,000	.....	.....
Montana-Dakota Utilities—1st mtg	12,000	.....	.....
Preferred Stock			
Rockland Light & Power	$4,000	.....	.....(c)
Central Hudson Gas & Electric—80,000 sh	.....	.....	.....
Indiana & Michigan Electric—40,000 sh $100 par	4,000	.....	Oct. 5
Northern States Power	20,000	.....	.....
Oklahoma Gas & Electric—75,000 sh $100 par	7,500	.....	.....

Notes—(a) Postponed indefinitely; Kidder, Peabody & Co, underwriters; (b) Temporarily postponed; Merrill, Lynch, Pierce, Fenner & Beane group, underwriters; (c) To be sold privately.

"Costs up again!"

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Crescent Electric Supply Co.
Dauphin Electrical Supplies
Dutton-Lainson Co.
Electrical & Mechanical Supply Corp.
Eoff Electric Co.
Evans Electrical Supply, Inc.
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Interstate Electric Co. of Shreveport, Inc.
Mack Electric Supply Co.
Maydwell & Hartzell, Inc.
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S. M. Supply Co., Inc.
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Stuart C. Irby Co.
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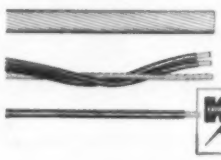
Kaiser Aluminum



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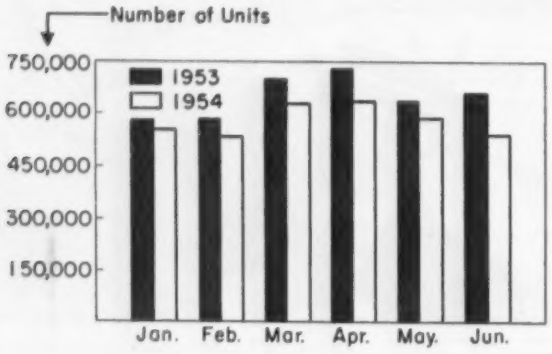
ELECTRICAL BUSINESS OUTLOOK



Sources: Ward's Automotive Reports, Mc Graw-Hill Department of Economics

Though consumer spending is down (see chart for automobile production, above), we have a . . .

July Surprise: A Stable Economy

July—usually a month of economic doldrums—opened on a note of remarkable stability this year. Industrial production in the previous two months was above the bottom hit earlier in the spring. And unemployment failed to take its usual big jump in June (EBO, June 7).

The relative stability is all the more remarkable in the light of one fact: The economic processes that started the recent "recession" are still continuing. The economy has been stabilized, at least for a while, in spite of the drag of continued reductions in business inventories, government spending, and consumer buying of durable goods.

Inventories were cut at a rate of $5-$6 billion a year in the second quarter. Federal spending is steadily being reduced. And consumers are spending $1-$2 billion less a year for new autos, (see production chart above) appliances, and other durable goods. A $3 billion rise in spending by state and local governments only partially offsets these drags on the economy.

Tax Cuts and Confidence . . . There are undoubtedly a lot of reasons why these declines have not had a worse affect on the economy than they have. But two factors stand out as particularly important: tax cuts and confidence. They have played a major part in keeping spending high in the rest of the economy.

Tax cuts have heavily cushioned the decline in income, both for consumers and for business. Consumer income has dropped about $6 billion from its 1953 peak. Yet consumers as a group are nearly as well off as they were before the drop started. The decline in the federal government's tax share of the public's income has gone down about $4 billion. And unemployment insurance has made up the other $2 billion. So income after taxes is practically unchanged from a year ago.

Corporate income before taxes is down even further than consumer income—$9 billion in a year. Yet elimination of the excess profits tax, and other tax factors, have held the drop in corporate income after taxes to only $3 billion. And depreciation charges have risen enough to keep actual cash income virtually the same as it was a year ago. Naturally, not every company and individual has managed to maintain income. Some companies and some consumers—the new unemployed, and those on short hours—have suffered. But the general flow of income has stayed high enough to support a high level of private business activity in the country.

Income and Spending Stability . . . This income stability is surprising enough. But the fact that business and individuals have maintained their spending is even more remarkable. Normally, a recession would be expected to scare a number of people out of the market. But, so far, people don't seem to be scared.

Consumers are spending just about as much for goods and services as they did a year ago. They are spending less for durable goods, about the same amount for nondurables like food and clothing, and much more for services like rent and electricity. Business has cut its spending for new plants and equipment only slightly. Spending for new construction is setting new records.

All this shows that people—both consumers and businessmen—have an amazing confidence that they are not going to be caught in an economic disaster. Probably this confidence, more than anything else, is responsible for sustaining economic activity this year.

Why are people confident, in the face of rising unemployment and idle industrial capacity? Is it because people have huge savings (more than $200 billion) to fall back on? Is it because the government itself has not been scared? Or is it just blind and unimaginative optimism?

The answer to these questions is all important, as a guide to future economic policies. It certainly won't be settled now, or for a long time in the future. But it may hold the key to understanding what has made our modern business system keep going.

All this does not mean that the decline in business activity has come to an end. Despite recent stability, there are still some trouble spots in the economy. The automobile industry is struggling with high inventories and lower sales. Unemployment will probably rise again in July. Cuts in inventories and government spending will continue to weight down other economic activity this summer. But the recent performance, based on confidence, gives vast encouragement for the future of the economy.

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